THE
LARYNGOSCOPE.

VOL. LII AUGUST, 1942. No. 8

FENESTRATION OF THE LABYRINTH: A REPORT AND ANALYSIS OF OPERATED CASES.*

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During the past year the subject of improvement of hearing by labyrinth fenestration has received a great deal of attention by otologists, with considerable variation in opinion regarding it. Some operators, after only a small experience with the operation itself, have been led to condemn it on the grounds that the cases lose the early improved hearing, while others claim success in a far greater percentage of cases than the facts appear to substantiate. A careful analysis of cases will show the actual results to lie somewhere between the pessimistic viewpoint of the one group of surgeons and the overly enthusiastic results of the other group of operators.

A year ago I reported, before this Society, my results in a series of 30 cases that had received the labyrinth fenestration operation for periods longer than eight months. Sixty-two per cent of these cases having suitable operative indications were successful from the standpoint of having retained a hearing improvement of more than 14 dcb. for the conversational frequencies 512, 1,024 and 2,048. During this past year I have tried to follow these cases carefully and at this time should like to make a follow-up report on these first cases and in addition report the results in 23 more cases which have been operated for eight months or longer.

The time of eight months has again been selected because I feel, as I said a year ago, that the end-result, as far as the reparative process following the operation is concerned, has

*Read at the Seventy-fifth Annual Meeting of the American Otological Society, Inc., Atlantic City, May 29, 1942.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, June 22, 1942.

been reached before this period of time after operation. My observation has shown that there is no further change of the hearing at an average of 3.4 months after operation. The time, eight months, after operation to estimate the end-result should be well within the variations that some cases may give. In this report all hearing changes will be calculated on the basis of the average audiometer readings for the frequencies 512, 1,024 and 2,048. All preoperative audiograms for each case have been averaged to obtain a basis for later comparison. The end-result was obtained by averaging the last three audiograms, except in those cases where too long an interval separated these last three audiograms.

FOLLOW-UP REPORT ON THE FIRST 30 OPERATED CASES.

1. Proper operative indications were present in 21.

2. Thirteen patients received an improvement of hearing of more than 14 dcb. each, success in 62 per cent of cases having suitable operative indications.

3. These 13 patients received an average of 23.6 dcb. improvement of hearing. One year ago the average for these same 13 patients was 21.8 dcb.

4. The eight unsuccessful cases now show an average loss of 3 dcb. as compared to an average loss of 4.8 dcb. a year ago.

5. The four cases which were revised have shown no change in the past year.

6. The fistula reactions of these 13 improved cases have remained essentially the same as they were a year ago. At present there is a 3+ reaction in four cases (Cases 1, 21, 22 and 25), 2+ reaction in seven cases (Cases 6, 8, 11, 12, 17, 18 and 27), 1+ reaction in Case 30 and a doubtful reaction in Case 29.

7. There has been no increase of the tinnitus in those cases which have been successful.

8. There have been no complications result in any of these cases nor other unusual development during the past year.

9. A study of the hearing changes in the unoperated ear shows in some cases a slight loss and in other cases a slight gain from the levels of a year ago.

In summarizing the follow-up report on these first 30 cases it can be stated that there has been no essential change in the hearing of any of the cases during the past year. The average improvement of the 13 successful cases shows a very slight gain over the level of a year ago. During this past year there has also been no gain or loss of more than 10 dcb. in the unoperated ear in any case. The fistula reactions have remained almost exactly the same as a year ago and there has been no change in the tinnitus.

RESULTS IN 23 ADDITIONAL CASES.

The results obtained in these 23 additional cases approximate very closely the results obtained in the first 30 cases. These latter cases have all been operated for a period of eight months or longer. Of these 23 cases, proper operative indications were present in 22. Eight of these cases had perfectly normal tympanic membranes and were apparently true otosclerotic cases. Ten cases showed some degree of thickening and retraction of the tympanic membranes and were probably cases of the so-called catarrhal deafness. Four cases showed tympanic membranes which were scarred and indicated the presence of suppurative otitis media at one or more times. The one patient with unsuitable operative indications was a case of nerve deafness with poor bone conduction. Ten of the 23 patients had a preoperative hearing loss of more than 60 dcb. Twelve of the cases were operated upon according to the technique described by Lempert. The remaining 11 patients were operated by a combined postauricular and endaural incision, the bone work being performed through the postauricular incision. In all cases the external semicircular canal was fenestrated. Any errors of technique will be recorded in the record of results. All cases were performed under local anesthesia except that in two cases ether was used in addition during the last hour of the operation. The results obtained in this series of 22 cases having suitable operative indications were as follows:

1. Thirteen patients received an improvement of hearing of more than 12 dcb. each.

2. The remaining nine patients received either a negligible improvement or a loss over the preoperative hearing.

3. These 13 patients received an average of 21 dcb. improvement of hearing.

4. The greatest improvement in any patient was 36 dcb. (Case 43) after an interval of one year from operation.

5. The nine unsuccessful cases received an average loss of 6.7 dcb. over the preoperative level.

6. Of the nine unsuccessful cases, four received from 2 to 9 dcb. improvement.

7. Of the eight cases with normal tympanic membranes (cases of probable otosclerosis), five received a substantial gain of hearing.

8. Of the 10 cases with thickened tympanic membranes (cases of catarrhal deafness), seven were successful, but the gain of hearing was not so great as in the otosclerosis group.

9. Of those four cases whose scarred tympanic membranes indicated a suppurative otitis media at some previous time, three patients received improvement of 24, 12.7 and 6.7 dcb., respectively; the remaining case lost 12 dcb. over the preoperative level.

10. Of those 10 patients who had profound deafness before operation (over 60 dcb. loss), six cases received substantial gain of hearing, one received slight gain and three lost hearing over the preoperative level.

11. Of those nine unsuccessful cases, all but one received satisfactory improvement of hearing shortly after the operation. In each of these cases this improvement was lost during the healing process.

12. One patient of this group was revised without success.

13. Of those 13 patients that received improvement of hearing, the fistula reaction was 3+ in two cases, 2+ in seven cases and 1+ in four cases.

14. Of those nine unsuccessful cases, only two retained any fistula reaction and in these cases it was only a mild reaction.

15. In every one of the successful cases the tinnitus was reduced in proportion to the amount of improvement of hearing.

16. Of those nine unsuccessful cases, the failure in each was attributed to closure or partial closure of the fistula by bone or fibrous tissue.

17. In these 23 cases, errors of technique were made as follows:

a. In two cases (Cases 43 and 52) the tympanomeatal flap was lacerated. The remnants of the flap were placed over the fistulized area and held in place by the gauze packing. These two cases received as the end-result 36 and 24 dcb. improvement of hearing, respectively.

b. In one instance (Case 44) the tympanic membrane was accidentally perforated. This laceration healed with only slight scar.

c. In one instance (Case 45) the incus was dislocated and removed. This case received a negligible improvement.

18. In this group of 23 operated cases, postoperative complications occurred as follows:

a. Facial paralysis developed in one patient (Case 37), beginning on the third day after operation and becoming complete seven days after operation. The facial function was entirely restored at the end of four weeks from operation.

b. Five cases became infected but the infection was quickly controlled by sulfathiazole powder with apparently no bad effects.

c. The external auditory canal became somewhat constricted in two cases, making the postoperative care of the operated area difficult.

d. Extremely slow healing was observed in two cases. This was attributed to the fact that the mastoid cells had been thoroughly exenterated.

COMMENT ON RESULTS IN THIS SERIES OF 23 OPERATED PATIENTS.

In this series of 22 patients with suitable operative indications, the improvement of hearing in 13 gives success in 59.9 per cent. This percentage is somewhat below the claims of certain others engaged in this work, but is based on a very careful observation and analysis of these cases and accurate recording of the results.

GENERAL SUMMARY OF RESULTS IN THE FIRST 53 OPERATED CASES.

1. Twenty-six patients received an improvement of hearing of more than 12 dcb. each — success in 60.5 per cent

of those cases possessing suitable operative indications (43 patients had suitable operative indications).

2. Of the 17 unsuccessful cases (of those having suitable operative indications), six received a small gain of hearing which was considered negligible.

3. The remaining 11 unsuccessful cases received some loss of hearing over the preoperative level.

4. These 26 successful cases received an average of 22.3 dcb. improvement of hearing over the preoperative level.

5. Of the 12 cases with normal tympanic membrane (cases of probable otosclerosis), seven received a substantial gain of hearing.

6. Of the 20 cases with various degrees of thickened tympanic membranes (cases of catarrhal deafness), 14 were successful.

7. Of the 11 cases whose scarred tympanic membranes indicated a suppurative otitis media at some previous time, six cases were successful.

8. Fourteen patients had profound deafness before operation (over 60 dcb. loss). Ten of these were successful.

9. Of those 17 cases which showed no improvement as the end-result, 14 showed satisfactory improvement of the hearing shortly after operation, but subsequently lost this improvement.

10. Of the five cases which were revised, no real success was obtained in any.

11. In the successful cases the fistula reaction remained strongly positive in the majority but was only moderately strong in the remainder.

12. The reduction of tinnitus was found to parallel closely the improvement of hearing obtained.

13. Of those 26 successful cases, errors of technique were made as follows:

a. In five patients the tympanomeatal membrane was badly lacerated. In two of these a skin flap was dissected from the anterior-superior canal wall and placed over the fistulized area. In the other three cases the remnants of the lacerated tympanomeatal membrane were placed over the fistula and held in place by gauze packing. These cases received 37, 25,

35, 36 and 34 dcb. improvement of hearing, respectively, as the end-result.

14. In these 53 operated cases postoperative complications were present as follows:

a. Facial paralysis developed in four patients. In each case the paralysis developed gradually, beginning three or four days after operation and in each case was entirely recovered in four to six weeks after operation.

b. Infection of the operative area occurred in 11 cases. In each case the infection was promptly controlled by sulfathiazole powder and no other complications secondary to the infections ensued.

c. Some constriction of the external auditory canal wall occurred in four cases.

d. Serous labyrinthitis developed in two patients.

e. Extremely slow healing was observed in several cases, which was attributed to the fact that a large area of the mastoid process had been excavated.

COMMENTS AND CONCLUSIONS.

In the presentation of the results obtained in this series of 53 operated cases it has been thought that they are the end-results as far as the reparative process following the operation is concerned. The follow-up observation during the past year on those 30 cases reported a year ago show that there has been practically no change in the hearing levels of those patients. I believe that patients who have retained hearing improvement beyond the eight months' period from operation will retain this hearing as far as any changes referable to the operation are concerned.

It is still too early to gain much impression on the question of whether or not the fenestration operation will retard or prevent further progress of the deafness in otosclerosis cases. In studying the audiometric records of both the operated and unoperated ears of my earliest operated cases, I can discover no changes in the hearing levels sufficient to justify any conclusions regarding this question. I believe, however, there is some hope that further progress of the deafness may be retarded in the fact that such an operation requiring the removal of the bony tissue adjacent to the labyrinthine capsule and the resultant healing changes may cause such

alterations in the vascular supply of this area that further bony deposition in the various parts of the internal ear mechanism is retarded or prevented. It will require years of further observation to be certain on this point.

Is the percentage of successful results in these operated cases sufficiently high to justify the operation? The answer to this question is definitely yes, but it must be emphasized that to obtain a practical improvement requires great care in the selection of the cases to be operated. Those patients with only moderate impairment of hearing (35 to 60 dcb. loss) stand a much better chance of obtaining a practical result than do those patients with more than 60 dcb. loss of hearing. However, in the latter cases the occasional brilliant success in which there may be 35 or more decibel gain of hearing encourages one to attempt the operation in even such cases of profound deafness. Fourteen of my operated cases have had a preoperative loss of hearing of more than 60 dcb. Ten of these have been successful from the technical standpoint (more than 12 dcb. improvement), and six of these 10 have been improved to the practical level of hearing so that they are pleased with the results obtained. It is encouraging to me to have obtained an improvement of hearing to a practical level in some of these cases when it is considered that in cases of such profound deafness at least some of this deafness is very probably of the nerve involvement type and not entirely of the conductive type.

The great majority of my operated cases continue to show, as the end-result, a reduction of the hearing from the best level obtained a few weeks after operation. In those cases which are successful, however, this reduction of the hearing from its best level stops at a point which retains improvement of a practical degree as the healing process is completed. Occasionally a patient will retain, as the end-result, all of the improved hearing that was obtained after the operation. Why an occasional case will retain the best hearing obtained after the operation is not clear. It should be expected that the healing process should result in some fibrotic changes in the fistulized area which would reduce the sound conduction through this area.

It may be argued that the best level of hearing is retained only in those cases which have been operated without the slightest error in the surgical technique. A number of my

cases, however, prove this not to be the case. Among my patients who have received the best results are five (Cases 1, 8, 29, 43 and 52) in which an accident ordinarily considered serious, occurred during the operation. In each of these cases the tympanomeatal flap was badly lacerated or destroyed. In the patient in which the flap was completely destroyed, a skin flap was dissected from the anterior-superior canal wall, stretched across the lumen of the external auditory canal and placed over the fenestrated semicircular canal. This was my first operated case and the result three years and nine months after the operation is a 37 dcb. improvement with the retention of an extremely active fistula. In the other four cases in which the tympanomeatal membrane was lacerated, the remnants of the membrane were placed over the fenestrated area as well as possible. These four patients have retained 25, 35, 36 and 24 dcb. improvement respectively. On the other hand, quite a number of patients who possessed the best possible operative indications and who were operated without the slightest error of technique have lost, as the end-result. every particle of the improved hearing which was present shortly after the operation. Still other cases (notably Cases 27 and 53) have been operated without errors and have retained exceedingly good hearing (38 to 33.4 dcb. improvement respectively). The factors concerned in the healing reaction at the fistulized area and with the preservation of the labyrinthine fistula are still not understood and can only be determined by co-ordinated clinical research and animal experimentation.

CONCLUSION.

In this analysis of results in patients who have received the labyrinth fenestration operation for deafness, an attempt has been made to present the facts and figures in a fair and unprejudiced manner. These facts and figures are such that the extremely critical analyst will find considerable material for condemnation of these particular cases and the operation in general. On the other hand, the enthusiastic optimist in this field of work can discover evidences of great encouragement in the results reported, particularly in the brilliant end-results in selected cases. It is hoped, however, that the great majority of persons will see in such a report sufficient encouragement to continue the work as a therapeutic procedure, but enough discouragement to realize the far from perfect results

thus far attained and the necessity for intensified clinical and experimental research to further advance such a promising start in this surgical procedure.

SUMMARY.

1. A follow-up report is made of the 30 cases of labyrinth fenestration operation reported one year ago.

2. It is found that there has been no essential change in the hearing of any of these cases during the past year. Furthermore, the fistula reactions have remained the same and there has been no change in the tinnitus.

3. The results obtained in 23 additional cases who received the labyrinth fenestration operation were reported in detail. Success was obtained in 59.9 per cent of these cases having suitable operative indications.

4. A general summary of results in the first 53 operated cases was recorded with analysis of certain features of the cases, including errors of technique, postoperative complications, etc.

5. In commenting on certain features connected with this work, the following opinions were expressed:

a. The end-result is attained by the end of eight months from the operation.

b. It is possible that the alteration of vascular supply of the inner ear produced by the changes incident to the operative procedure may retard or prevent further progress of the deafness in otosclerosis.

c. The percentage of successful results in such operated cases is sufficiently high to make it a practical therapeutic procedure providing the operative indications are adhered to.

d. The occasional brilliant result obtained in profoundly deafened patients (conductive deafness) justifies the operation in such cases.

e. The fact that some patients operated with serious errors of technique receive brilliant results, while other patients operated with perfect technique are failures, indicates that the factors concerned in the preservation of the labyrinthine fistula are but little understood.

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TABLE 1. SUMMARY OF GENERAL DATA

Case Age Sex Ear Oper.	First Aud. Operated On Last Aud.	Familial Deafness	Duration of Deafness In Years	Tinnitus	Previous Treatment	Condition of Tympanic Membrane	Bone Conduction	Condition of Eustachian Tube	Diagnosis
31 32 F. R.	7-20-40 9-12-40 2-26-42	Sister	4	++	Inflation: Nose Operation.	Normal.	Normal; >A. C. Lat. ?	Inflation Normal.	Oto- sclerosis.
32 20 M. R.	9-10-40 10-23-40 3-28-42	None	4½	++	Tonsillec- tomy; Inflation; Nasal.	Normal.	Normal; >A. C. Lat. to Left.	Inflation Normal.	Oto- sclerosis. ?
33 17 M. R.	11- 8-40 11-20-40 4-21-42	Grand- parents	4	+	Tonsillec- tomy; Nasal.	Normal.	Normal; >A. C. Lat. to Right.	Inflation Normal.	Oto- sclerosis.
34 18 M. R.	10-24-40 11-21-40 4-11-42	None	2	+	Tonsillec- tomy; Inflation; Nasal.	Thicken- ing.	Normal; >A. C. Lat. to Right.	Inflation Normal.	Chronic Catarrhal Deafness.
35 33 F. L.	11-12-40 11-27-40 4-24-42	Mother Sister	14	++	Tonsillec- tomy; Inflation; Nasal.	Normal.	Normal; >A. C. Lat. to Right.	Inflation Normal.	Oto- sclerosis.
36 38 F. R.	12- 2-40 12- 5-40 9-10-41	None	16	++	Submucous Resection; Inflation; Prostig- mine.	Slight Thicken- ing.	Normal; >A. C. Lat. to Right.	Inflation Normal.	Oto- sclerosis. ?

(Continued)

TABLE 1. SUMMARY OF GENERAL DATA (Continued)

Case Age Sex Ear Oper.	First Aud. Operated On Last Aud.	Familial Deaf- ness	Duration of Deafness In Years	Tinnitus	Previous Treat- ment	Condition of Tympanic Membrane	Bone Conduc- tion	Condition of Eustachian Tube	Diagnosis
37 37 F. R.	12-20-40 1- 2-41 1-27-42	Mother Sister	6	None	Inflation; Nasal.	Slight Thicken- ing.	Normal; >A. C. No Lat.	Inflation Normal.	Oto- sclerosis.
38 39 F. R.	10-28-38 2- 6-41 4-22-42	Sister	15	+	Inflation; Nasal Treat. & Oper.	Thickened.	Normal; >A. C. No Lat.	Inflation Normal.	Chronic Catarrhal Deafness.
39 48 F. R.	2-11-41 2-14-41 4-11-42	Grand- mother	3	+++	Tonsillec- tomy; Inflation; Nasal.	Slight Thicken- ing.	Normal; >A. C. No Lat.	Inflation Normal.	Oto- sclerosis.
40 22 F. R.	2-17-41 2-27-41 4- 7-42	None	9	++	Inflation; Nasal.	Slight Thicken- ing.	Normal; >A. C. Lat. to Right.	Inflation Normal.	Chronic Catarrhal Deafness.
41 41 F. R.	2-26-41 3- 6-41 1-22-42	Brother Sister	16	++	Tonsillec- tomy; Inflation; Nasal.	Thicken- ing, Re- traction, Scars, Healed. Perf.	Impaired; >A. C. Lat. ?	Inflation Ob- structed.	Chronic Catarrhal Deafness.
42 45 M. L.	3-14-41 3-19-41 4-18-42	None	1	+	Inflation; Nasal.	Thicken- ing.	Impaired; >A. C. Lat. to Right.	Inflation Normal.	Chronic Catarrhal Deafness.

43 38 F. L.	3-20-41 3-26-41 3-21-42	None	2	++	Inflation; Nasal.	Thickening. Scars.	Normal; >A. C. Lat. to Left.	Inflation Normal.	Chronic Catarrhal Deafness.
44 39 F. L.	3-27-41 4- 4-41 4-18-42	Sister	29	++	Inflation; Nasal.	Thickening, Retraction, Scarring, Calcium, Healed Perf.	Impaired; >A. C. Lat. to Right.	Inflation Obstructed.	Chronic Catarrhal Deafness.
45 38 M. R.	4- 4-41 4-10-41 9-22-41	Grandfather	6	None	Tonsillectomy.	Thickening.	Sl. impaired; >A. C. Lat. to Left.	?	Chronic Catarrhal Deafness.
46 17 F. R.	4-15-41 4-17-41 2-11-42	Mother	3	+	Inflation.	Slight Thickening.	Normal; >A. C. Lat. to Right.	Patulous.	Otosclerosis.
47 30 M. R.	4- 3-41 4-23-41 2-28-42	?	7	++	?	Thickening; Retraction; Healed Perf.	Normal; >A. C. No Lat.	?	Chronic Catarrhal Deafness.
48 26 F. R.	4-26-41 5- 2-41 3-28-42	None	5	+	Tonsillectomy; Inflation.	Thickening.	Normal; >A. C. Lat. to Right.	Patulous.	Otosclerosis. ?

(Continued)

TABLE 1. SUMMARY OF GENERAL DATA (Continued).

Case Age Sex Ear Oper.	First Aud. Operated on Last Aud.	Familial Deafness	Duration of Deafness In Years	Tinnitus	Previous Treatment	Condition of Tympanic Membrane	Bone Conduction	Condition of Eustachian Tube	Diagnosis
49 38 F. L.	12-30-40 6- 3-41 5-15-42	Father	14	++	Inflation; Nasal; Hearing Aid.	Slightly Retracted.	Normal; >A. C. Lat. to Left.	Patulous.	Otosclerosis.
50 23 F. R.	5-21-41 6-21-41 9-10-41	?	22	None ?	?	Slight Thickening.	Much Impaired; >A. C. Lat. to Right.	Patulous.	Nerve Deafness.
51 19 M. L.	5-27-41 6-12-41 12-24-41	Father Sister	3	None	Inflation; Nasal; Etc.	Normal.	Normal; >A. C.	Patulous.	Otosclerosis.
52 27 F. L.	6-10-41 6-19-41 4-11-42	Sister	15	+++	Inflation; Bougies; Nasal.	Thickening, Retraction, Healed Perf.	Normal; >A. C. Lat. to Left.	Patulous.	Chronic Catarrhal Deafness.
53 21 F. L.	9-13-41 9-18-41 4-28-42	None	7	++	Tonsillectomy; Inflation.	Normal.	Normal; >A. C. Lat. to Left.	Patulous.	Otosclerosis.

The following abbreviations are used: Aud., audiogram; >, greater than; A. C., air conduction; lat., lateralization; M., male; F., female; R., right; L., left; Sl., slight; + indicates slightly present; ++ indicates moderately severe; +++ indicates severe or marked.

TABLE 2. SUMMARY OF OPERATIVE DATA.

Case Age	Technique	Time After Oper.	Aver. Dec. Change	Fistula Reaction	Change of Tinnitus	Operative Indications	Complications	Cause of Failure	Revision Result	Time End-Result Obtained After Oper.
31 32	Complete Endaural. No Errors.	9 Mos.	1.1 Loss.	—	No Change.	Present.	None.	Closure of Fistula.	Failure. Fistula Re-closed.	6 Mos.
32 20	Complete Endaural. No Errors.	1 Yr., 4 Mos.	19.4 Gain.	++	Much Improved.	Present.	Constricted Canal.			4 Mos.
33 17	Complete Endaural. No Errors.	1 Yr., 5 Mos.	24 Gain.	++	Entirely Relieved.	Present.	None.			3½ Mos.
34 18	Complete Endaural. No Errors.	1 Yr., 5 Mos.	16.3 Gain.	+	Much Improved.	Present.	Infected Wound.			3 Mos.
35 33	Complete Endaural. No Errors.	1 Yr., 5 Mos.	29.6 Gain.	++	Much Improved.	Present. Thickened Drum	None.			6 Weeks ?
36 38	Complete Endaural. No Errors.	9 Mos.	25 Gain.	++	Much Improved.	Present. Thickened Drum.	None.			3 to 4 Mos.
37 37	Complete Endaural. No Errors.	1 Yr.	12.6 Gain.	+	No Change.	Present. Thickened Drum.	Temporary Facial Paralysis.			2½ Mos.
38 39	Complete Endaural. No Errors.	1 Yr., 2 Mos.	14 Gain.	+	Sl. Improved.	Present. Thickened Drum.	None.			?

(Continued)

TABLE 2. SUMMARY OF OPERATIVE DATA (Continued).

Case Age	Technique	Time After Oper.	Aver. Dec. Change	Fistula Reaction	Change of Tinnitus	Operative Indications	Complications	Cause of Failure	Revision Result	Time End-Result Obtained After Oper.
39 48	Complete Endaural. No Errors.	1 Yr.	13 Gain.	++	Very Much Improved.	Present. Thickened Drum.	None.			4 to 6 Mos.
40 22	Complete Endaural. No Errors.	14 Mos.	7 Loss.	—	Not Improved.	Present. Thickened Drum.	Infected Wound. Constricted Canal.	Infection ?		2 Mos.
41 41	Complete Endaural. No Errors.	11 Mos.	6 Loss.	—	Not Improved.	Present Except Scarred Drum.	Infected Wound. Dermatitis of Canal.	Infection ?		3 Mos.
42 45	Complete Endaural. No Errors.	13 Mos.	8.4 Loss.	++	No Change.	Present Except Thickened Drum.	None.	Closure of Fistula.		3½ Mos.
43 38	Combined Endaural & Postauric. Flap Torn. Drum Perf.	1 Yr.	36 Gain.	+++	Very Much Improved.	Present. Thickened & Scarred Drum.	None.			?
44 39	Combined Endaural & Postauric. Drum Perf.	1 Yr.	6.7 Gain.	+	Sl. Improved.	Present Except Thickened & Scarred Drum.	None.	Closure of Fistula.		3 Mos.

45 38	Combined Endaural & Postauric. Incus Removed.	5½ Mos.	8.6 Gain.	+	No Change.	Present. Thickened Drum.	Very Slow Healing.	Closure of Fistula.		4 Mos.
46 17	Combined Endaural & Postauric. No Errors.	10 Mos.	13.3 Gain.	++	Sl. Improve ment.	Present. Thickened Drum.	None.			4 Mos. ?
47 30	Combined Endaural & Postauric. No Errors.	10 Mos.	12.7 Gain.	+	Sl. Improv-ment.	Present Except Scarred Drum.	Wound Infected.			2½ Mos.
48 26	Combined Endaural & Postauric. No Errors.	11 Mos.	1.6 Loss.	—	No Improve-ment.	Present. Thickened Drum.	Slow Healing.	Closure of Fistula.		4 Mos.
49 38	Combined Endaural & Postauric. No Errors.	11 Mos.	4.3 Gain.	—	Not Improved.	Present Except Retracted Drum.	None.	Closure of Fistula.		?
50 23	Combined Endaural & Postauric. No Errors.	3 Mos.	13 Loss.	?	No Change.	Poor Bone Conduction.	None.	Improper Oper. Indi-cations.		?
51 19	Combined Endaural & Postauric. No Errors.	6½ Mos.	37 Loss.	—	In-creased.	Present.	Probable Laby-rinthitis.	Infection of Wound.		?

(Continued)

TABLE 2. SUMMARY OF OPERATIVE DATA (Continued).

Case Age	Technique	Time After Oper.	Aver. Dec. Change	Fistula Reaction	Change of Tinnitus	Operative Indications	Complications	Cause of Failure	Revision Result	Time End-Result Obtained After Oper.
52 27	Combined Endaural & Postauric. No Errors.	9 Mos.	24 Gain.	++	Much Improved.	Present Except Scarred Drum.	None.			5 Mos.
53 21	Combined Endaural ½ Postauric. No Errors.	8 Mos.	33.4 Gain.	+++	Much Improved.	Present.	None.			3 Mos. ?

The following abbreviations are used: Aver., average; Dec., decibel; Oper., operation; —, negative; +, slightly positive; ++, moderately positive; +++, strongly positive; Yr., year; Mo., month; Postauric., postauricular; Perf., perforated; ?, doubtful; Sl., slight.

TABLE 3. AUDIOGRAMS OF OPERATED AND UNOPERATED EARS.

Case Ear Oper.	OPERATED EAR: Average of Preoper. Aud. / Aud. at Time of Best Postoper. Hearing / Aver. of Last 3 Audiograms							Aver. Dec. Loss for Freq. 512 1,024 2,048	Time After Oper.	UNOPERATED EAR: Average of Preoper. Aud. / Aud. at Time of Best Hearing in Oper. Ear / Aver. of Last 3 Audiograms							Aver. Dec. Loss for Freq. 512 1,024 2 048
	128	256	512	1,024	2,048	4,096	8,192			128	256	512	1,024	2,048	4,096	8,192	
31.	59	53	51	51	48	48	43	50.	4 Weeks	43	43	44	42	33	25	26	39.6
R.	20	15	10	5	10	35	30	8.3	9 Mos.	40	45	40	40	30	20	15	36.6
	60	55	55	50	50	70	60	51.6		50	50	40	35	35	20	25	36.6
31.	72	60	58	52	52	57	50	54.	3 Weeks	47	48	42	40	33	22	25	38.3
Revi-	30	30	25	10	25	50	45	20.	8 Mos.	50	50	50	35	25	20	25	36.6
sion.	50	55	60	45	50	70	55	51.6		55	50	55	40	25	15	25	40.1
32.	53	50	57	48	63	67	100	56.	6 Weeks	45	40	47	45	48	67	70	46.6
R.	10	25	20	10	25	85	40	18.3	1 Yr., 4 Mos.	40	40	45	35	45	75	100	41.6
	20	25	40	35	35	70	50	36.6		30	30	40	40	40	65	50	40.
33.	53	55	60	45	47	50	48	50.6	21 Days	55	53	53	40	38	47	37	43.6
R.	10	15	20	5	10	40	30	11.6	1 Yr., 5 Mos.	45	40	55	35	35	40	30	41.6
	25	30	35	30	15	40	45	26.6		45	45	45	45	35	40	35	41.6
34.	63	66	68	57	44	54	40	56.3	3 Weeks	29	29	30	26	23	31	32	26.3
R.	35	30	20	5	10	20	25	12.6	1 Yr., 5 Mos.	20	25	25	25	5	10	25	18.3
	65	60	60	30	30	60	45	40.		15	20	25	30	10	10	20	21.6
35.	53	55	70	64	60	85	100	64.6	2 Mos., 1 Wk.	43	48	49	48	45	76	100	47.3
L.	20	25	30	20	45	55	100	31.6	1 Yr., 5 Mos.	35	40	45	45	40	85	100	43.3
	30	30	40	25	40	70	100	35.		30	30	40	60	45	75	100	48.3
36.	63	52	55	63	72	62	70	63.3	7 Weeks	42	45	50	52	58	42	52	53.3
R.	30	25	20	30	30	60	55	26.6	9 Mos.	40	40	50	50	65	50	100	55.
	25	30	35	40	40	50	50	38.3		45	50	40	60	60	55	50	53.3

(Continued)

TABLE 3. AUDIOGRAMS OF OPERATED AND UNOPERATED EARS (Continued).

Case Ear Oper.	OPERATED EAR: Average of Preoper. Aud. / Aud. at Time of Best Postoper. Hearing / Aver. of Last 3 Audiograms							Aver. Dec. Loss for Freq. 512 1,024 2,048	Time After Oper.	UNOPERATED EAR: Average of Preoper. Aud. / Aud. at Time of Best Hearing in Oper. Ear / Aver. of Last 3 Audiograms							Aver. Dec. Loss for Freq. 512 1,024 2 048
	128	256	512	1,024	2,048	4,096	8,192			128	256	512	1,024	2,048	4,096	8,192	
37.	65	68	85	78	70	86	100	77.6	2 Mos., 3 Wks.	39	40	55	66	55	85	100	58.6
R.	50	55	65	50	50	75	100	55.	1 Yr.	55	45	55	65	50	100	100	56.6
	55	65	80	55	60	75	100	65.		50	45	50	70	50	80	100	56.6
38.	100	73	77	67	38	42	52	60.6	8 Weeks	100	77	73	72	50	50	39	65.
R.	40	35	35	35	25	30	60	31.6	14 Mos.	65	65	60	60	45	60	35	55.
	60	60	50	55	35	50	45	46.6		100	65	60	60	45	50	45	55.
39.	40	43	47	40	57	73	55	48.	2 Mos.	33	35	42	45	53	73	100	46.6
R.	15	10	10	10	25	70	40	15.	1 Yr.	30	30	35	50	55	75	100	46.6
	35	35	30	30	45	75	100	35.		50	45	40	55	55	75	100	50.3
40.	53	53	65	65	75	62	70	68.3	1 Mo.	40	42	52	43	42	40	43	45.6
R.	60	60	65	50	45	80	100	53.3	1 Yr., 2 Mos.	35	35	45	45	40	50	35	43.3
	65	70	90	75	75	80	100	80.		35	40	50	40	25	45	45	38.3
41.	55	62	73	58	58	82	100	63.	25 Days	48	48	57	42	47	62	100	48.6
R.	30	35	50	40	35	85	100	41.6	11 Mos.	40	45	65	40	55	55	100	53.3
	65	70	80	70	75	80	100	75.		50	55	65	55	55	65	100	58.3
42.	33	33	45	32	33	47	37	36.6	3 Mos.	33	33	37	28	33	35	43	32.6
L.	10	20	40	10	10	50	100	20.	1 Yr., 1 Mo.	10	15	25	15	25	25	40	21.6
	40	45	70	40	25	70	100	45.6		20	20	30	20	25	35	50	25.
43.	58	62	63	63	57	78	100	61.	2½ Mos.	43	40	45	43	40	50	100	42.3
L.	30	25	20	30	25	60	100	25.	1 Yr.	35	30	45	35	35	45	55	38.3
	30	20	20	25	25	80	100	25.		30	35	50	40	35	50	100	41.6
44.	62	62	58	58	43	65	40	53.	7 Weeks	57	55	55	40	40	48	43	45.
L.	30	25	20	10	10	40	40	13.3	13 Mos.	50	50	50	40	40	50	45	43.3
	45	50	60	45	35	70	100	46.6		45	45	55	40	40	40	45	45.

45.	38	40	43	40	30	72	100	37.6	2 Mos.	32	33	32	28	27	50	100	29.
L.	20	20	20	15	5	75	100	13.3	5 Mos.	30	30	40	25	25	50	100	30.
	25	38	42	25	20	85	100	29.		27	33	37	30	30	47	100	32.3
46.	40	42	43	35	47	60	55	41.6	6 Weeks	17	20	27	17	10	60	40	18.
R.	5	10	15	10	10	50	40	11.6	10 Mos.	25	25	30	15	15	50	40	20.
	30	30	35	30	20	75	55	28.3		15	20	30	15	15	50	35	20.
47.	41	41	53	64	61	70	52	59.3	6 Weeks	40	43	48	55	55	60	20	52.6
R.	15	25	25	30	45	60	40	33.3	10 Mos.	35	35	50	60	60	55	30	56.6
	30	30	40	55	45	80	100	46.6		45	45	60	65	65	60	40	63.3
48.	50	45	45	33	42	48	45	40.	6 Weeks	20	18	18	10	20	33	17	16.
R.	20	20	20	15	20	50	40	18.3	10 Mos.	25	15	15	5	20	30	10	13.3
	55	55	50	35	45	50	50	43.3		20	20	20	10	15	20	15	15.6
49.	56	65	77	76	85	85	100	79.3	3 Weeks	65	70	80	70	80	100	100	76.6
L.	50	60	65	60	45	100	100	56.6	11 Mos.	65	60	75	70	75	100	100	73.3
	50	65	80	65	80	100	100	75.		65	65	85	70	80	100	100	78.3
50.	44	54	72	84	95	100	100	83.6	9 Days	64	65	72	80	85	100	100	79.
R.	70	70	90	100	100	100	100	96.6	3 Mos.	60	65	75	85	90	100	100	83.3
	70	75	90	100	100	100	100	96.6		60	65	65	90	85	100	100	80.
51.	53	40	42	38	35	48	23	38.3	1 Mo.	38	38	43	27	33	43	22	34.3
L.	65	60	65	50	15	80	60	43.3	6 Mos.	45	35	40	30	35	45	20	35.
	100	80	80	75	70	85	55	75.		40	40	50	30	30	40	15	36.6
52.	43	45	60	45	37	57	28	47.3	9 Weeks	47	48	63	53	33	48	25	49.6
L.	15	5	20	5	5	40	35	10.	9 Mos.	45	35	50	45	40	50	25	45.
	25	25	30	25	25	30	55	23.3		45	40	50	40	40	40	30	43.3
53.	50	45	52	45	35	53	28	45.	5 Mos.	43	43	48	33	30	67	38	37.
L.	25	25	15	5	0	35	20	6.6	8 Mos.	45	45	40	30	30	65	35	33.3
	20	20	15	10	10	40	30	11.6		40	35	50	30	30	55	45	36.6

The following abbreviations are used: Aver., average; Preoper., preoperative; Aud., audiograms; Dec., decibel; Freq., frequencies; Yr., year; Mo., month; Wk., week; R., right; L., left.

TABLE 4. CASES SHOWING IMPROVEMENT FOR MORE THAN 8 MONTHS AFTER OPERATION.

Case No.	Time Since Oper.	Aver. Dec. Loss Before Oper.	Aver. Dec. Loss After Oper.	Aver. Dec. Improvement	Fistula Reaction
1	3 Yrs., 9 Mos.	68.3	31.6	37.	+++
6	2 Yrs.	76.6	60.	16.6	++
8	1 Yr., 2 Mos.	76.6	51.6	25.	++
11	3 Yrs.	42.3	20.	22.3	++
12	3 Yrs.	96.6	73.3	23.3	++
17	2 Yrs., 7 Mos.	57.	43.	14.	++
18	1 Yr., 9 Mos.	63.3	45.	18.3	++
21	2 Yrs.	61.6	48.3	13.3	+++
22	1 Yr., 11 Mos.	61.6	41.6	20.	+++
25	1 Yr., 8 Mos.	43.	18.3	24.7	+++
27	1 Yr., 9 Mos.	44.6	6.6	38.	++
29	1 Yr.	57.7	22.2	35.5	?
30	4 Mos.	42.	23.3	18.7	+
32	1 Yr., 4 Mos.	56.	36.6	19.4	++
33	1 Yr., 5 Mos.	50.6	26.6	24.	++
34	1 Yr., 5 Mos.	56.3	40.	16.3	+
35	1 Yr., 5 Mos.	64.6	35.	29.6	++
36	9 Mos.	63.3	38.3	25.	++
37	1 Yr.	77.6	65.	12.6	+
38	1 Yr., 2 Mos.	60.6	46.6	14.	+
39	1 Yr.	48.	35.	13.	++
43	1 Yr.	61.	25.	36.	+++
46	10 Mos.	41.6	28.3	13.3	++
47	10 Mos.	59.3	46.6	12.7	+
52	9 Mos.	47.3	23.3	24.	++
53	8 Mos.	45.	11.6	33.4	+++

THE CASE FOR THE HEARING AID.*

DR. GORDON BERRY, Worcester, Mass.

Perhaps three months ago two ladies were attending a convention of normally hearing people. One was wearing a hearing aid and was a good lip-reader. There were important discussions from the floor in which the hearing-aid lady was invited to participate. At the close of the meeting, the other lady complimented her upon the facility of her participation and the accurate interpretation the hearing aid gave her. She added that she, herself, had formerly used a hearing aid. "But you hear so well without an aid, did you perchance have the window operation?" "Yes, but I have hesitated to mention it," said the second. "That seems strange. May I ask why?" "Because the first year after the operation was so difficult and unhappy for me, I would not wish another to have such an experience."

The lady wearing the hearing aid had an 80 dcb. loss of hearing. I do not know how impaired the fenestrated case was; we may be sure she never was as deaf as the other. Both ladies enjoyed adequate corrected hearing, for the environment in which they were placed. Here, then, are the two types of reconstructive effort for the hard-of-hearing to which I would draw your attention today. Let us try to contrast them. What can be expected from the fenestration operation, and what help may be secured from a properly fitting hearing aid? As I have not performed this operation and as I do wear a hearing aid, I start out partial to the hearing aid, but this does not prevent my seeking and reporting the evidence the leading exponents of the operation present and contrasting it with claims of hearing-aid manufacturers. The audience can determine whether this evidence justifies the conclusions.

There has been much in the literature lately concerning the fenestration operation which, when analyzed, is found to be the successive reportings of a few leaders, together

*Read at the Seventy-fifth Annual Meeting of the American Otological Society, Inc., Atlantic City, May 29, 1942.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, June 23, 1942.

with added reports from less experienced operators who in essence offer a comparison of their own work with that of these leaders. The early work resulted in many failures. We may regret these, and we may question the enthusiasm which permitted them; but today, we are not concerned with the past, rather are we seeking to discover what a skilled operator can now expect from this operation, after all the groundwork has been done. I have selected for this comparison reports by Shambaugh, Fowler, Jr., Lempert and Campbell. There are other skilled workers in this field, but these articles are recent and will serve our need well.

In 1938, Shambaugh[1] reported on his first 12 cases and found the results discouraging. Last summer, while addressing a convention of hard-of-hearing people, he said:[2] "From July, 1938, to the first of May of this year (1941), I have operated on a total of 72 persons with otosclerosis. Fifteen of these were operated a second time for enlarging or reopening the window. In 60 cases, or 83 per cent of those operated, the hearing improvement was very satisfactory, so that these people now have what we call practical hearing. Ordinary conversation can be carried on without difficulty, the movies and the theatre can be enjoyed and every one of these who had used a hearing aid before operation now has more hearing than was obtained from the hearing aid, as well as having natural hearing such as is never secured with the best hearing aid." This seems to advise these hard-of-hearing people to throw away their hearing aids and have the fenestration done, if they are suitable cases. Then he adds: "The operation is still in its infancy," and "only a few otologists have as yet qualified themselves to carry out the intricate and delicate technique of the operation."

In time to interpolate it here, another article[3] has just been published by this same author, reporting his results in 128 consecutive ears of 117 patients operated on up to December, 1941. He finds that 65 of these patients now enjoy an apparently permanent average gain of 25.7 dcb. for the speech frequencies — a splendid showing. He does not show his failures.

Fowler, Jr.,[4] is not so optimistic when he discusses his work with monkeys. Here is careful experimental work, done under ideal conditions, checked by every detailed scentific

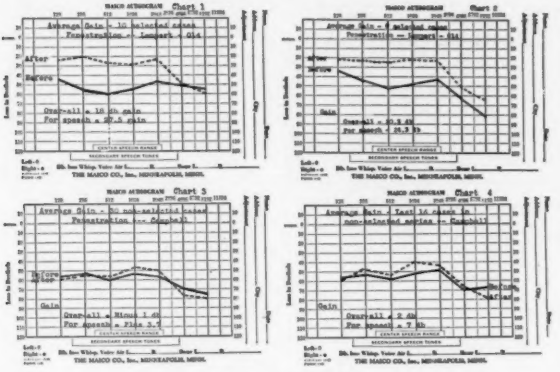
means known. He makes the following points: Careful anatomical measurements lead him to conclude that the skin flap so essential to the Lempert procedure cannot be made long enough to cover the fenestration. Again, when Thiersch grafts were used on these monkeys they tended to form epidermal inclusion cysts (cholesteatomas). Third, the usual end-result was a bony closure of the labyrinthine fistula. It may not be safe to make parallel conclusions for similar operations on humans, but these results invite critical consideration.

Reference is interpolated here of Hughson's[5] careful work on round window grafts. His cautious reporting of 36 operative cases wins the confidence of the reader and persuades him that the claim of no harm from the operation and a "trend toward an improvement in hearing" is conservative. His best maximum gain was an average of 25 dcb., and his final maximum gain averaged 16.25 dcb. His routine gain, according to the charts, ranged between 5 and 15 dcb. gain at some frequencies and a questionable gain at others. Subjectively, too, there was some gain. In these and later figures I must ask the indulgence of the men whose articles I am quoting. I have summarized pages of figures and may be in error at some point.

Lempert[6] reports the largest number of fenestration operations; 375 in his listed series. Of these, 300 windows were made into the external semicircular canal, and 75 were made into the vestibular dome, his fenestra novovalis. In these last 75 he claims no bony closure. The audiometric results of 18 selected cases are given: 10 by the semicircular canal fenestration and eight by the fenestra novovalis route into the vestibule. For the purposes of comparison, I have worked out the averages for both groups. In the first group of 10 the average gain for all seven frequencies tested was 18 dcb. Chart 1 (above left) shows in the broken line this postoperative gain. The second group of eight gave an average gain of 20.3 dcb. This is shown in the second chart (above right), where the gains in the lower tones are not quite as great, while the gain in the high tones is better than in the first group. This gives us a favorable overall average for these selected cases of 19 dcb. gain for the end-result in all 18 cases. If only the central conversational range figures are

averaged (frequencies 512, 1,024, 2,048), the first group shows a 27.5 dcb. gain, and the fenestra novovalis group shows a 24.3 dcb. gain. These are good gains, but Dr. Lempert would be the first to tell us that these were selected cases and probably show maximum gains.

For our last illustration of what gain to hearing may be secured by operative work, let us turn to Campbell's[7] considered report before this Society last year. First, we may refer to points on operative technique, then to results secured.



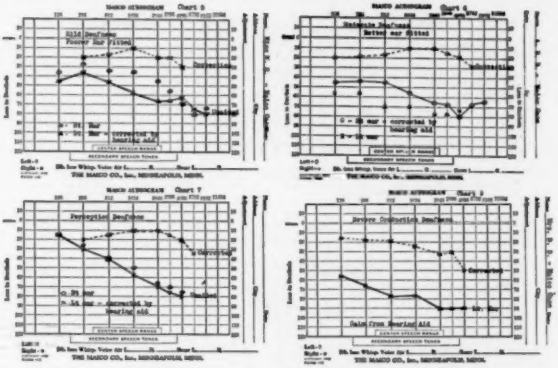
Charts 1, 2, 3, 4.

In contradistinction to Lempert, Campbell insists that the endosteum not be removed; that the Shrapnell's membrane flap rarely reaches far enough to cover the fenestration (an opinion supported by Fowler, Jr.); and that a better result, with less bone formation, is expected if the undersurface of the flap is raw and not lined with skin. Thus we have two of the leading operators in this field differing emphatically on points they claim to be essential to operative success. These operative details become germane to this discussion insofar as they may indicate confusion and uncertainty among those advocating the fenestration procedure.

A group of 13 selected cases reported by Campbell gave an operative average of 21.8 dcb. This parallels the other two operators. The best single gain showed an apparently permanent improvement of 35.7 dcb. This is remarkable, and very worthwhile; but the worst had a loss of 30 dcb. The average in the entire series of 30 consecutive cases reported

(as I figure it in Chart 3, lower left) was an overall loss of 1 dcb., and a gain for the speech range of 3.7 dcb. Chart 4 shows a composite picture of the second half of this consecutive series. This is done with the thought that his more recent work would give a fairer index of what Dr. Campbell should expect from this operation. The average postoperative gain overall is 2 dcb., and for the conversational zone is 7 dcb. This shows the difference in the results from a selected group and those from a consecutive series, which includes the bad with the good.

Let us now discover what a well-fitting hearing aid can do. This is not as simple as one would expect, for acoustical engi-



Charts 5, 6, 7, 8.

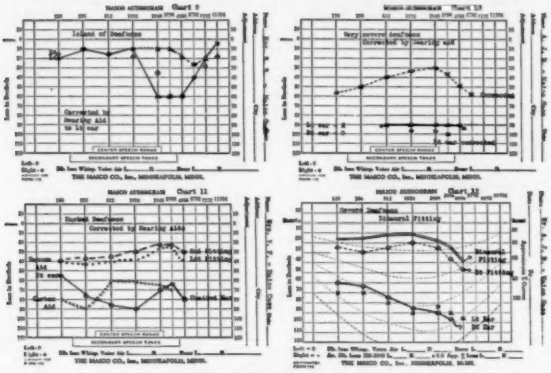
neers have as yet no uniform standards as to performance. The Council of Physical Therapy, the Acoustical Society and the Bureau of Standards have continued to urge that such standards be established and that the different hearing aids on the market be calibrated against these standards.

I have written a few of the leading acoustical engineers for information on this point. Mr. Watson,[8] of the Maico Co., and Mr. Huth, of the Aurex Corp., have generously responded; also Mr. Howard Carter, of the Council of Physical Therapy, and Mr. J. B. Kelly, of the Bell Telephone Laboratories. Here again, as in the operative reports, I am giving their selected figures, quoting the sources of my authority.

First we will consider Mr. Watson's graphs, 13 in all. Please contrast these in your mind with the graphs already

shown. The following two slides give eight charts, selected by him for their variety. The first four charts show differing types of deafness in varying severity, and their correction. The right ear is indicated by a circle and the left ear by a cross. The unbroken line gives the graph for the unaided ear to be fitted, and the broken line shows the gain enjoyed after correction with a well fitted hearing aid. All these cases used a vacuum tube air conduction instrument.

Miss M. S. (upper left, Chart 5) shows a mild deafness. She was fitted for the poorer, left ear because the right ear showed less than 50 dcb. loss in hearing. This meant that the better ear could function to some extent unaided and should not be covered. At 1,024-2,096 cycles, a corrective 40 dcb.



Charts 9, 10, 11, 12.

gain was shown; at 512 and at 4,096 this gain dropped to 30 dcb.

In A. R. B. (upper right, Chart 6) we have a more marked deafness. The better ear was below an approximate average of 50 dcb. loss and, therefore, was of little use unaided. So the hearing aid was put on this better ear. Here the gain at 1,024-4,096 was more than 50 dcb., with 30 dcb. gain at 512 and 5,792.

Case F. R. A. (lower left, Chart 7) showed a typical declining graph. Selective amplification increased the higher tones 60 dcb. and gave an average gain of 42 dcb. for the entire range (256-4,096).

Mrs. D. B. (lower right, Chart 8) showed a severe loss. Amplification stepped this hearing up an average of 50 dcb. for the entire range, from 128 to 4,096. These are startling gains.

The second group shows four rather unusual fittings. Mrs. B. B. (upper left, Chart 9) is given to show how a selective amplification can even up a sudden localized drop in the important 2,000 to 5,000 range.

Case A. J. D. (upper right, Chart 10) shows how even a 90 dcb. loss can gain a useful hearing, as also pointed out by Fowler, Sr.[9]

Case Mrs. V. F. (lower left, Chart 11) shows a profound loss in the right ear which improved 25 to 30 dcb., at the 512-1,024 levels only, by a carbon aid (indicated by the c-c-c line); but note the great gain (60 dcb. at one point) from a first and then a second fitting with a vacuum tube aid.

Case Mr. A. J. D. (lower right, Chart 12) shows the added gain in a severely deafened case by the occasional employment of a binaural fitting.

The acoustic engineer has another way to record the performance of such an amplifying electrical unit. He calls it a "pressure calibration" and gives it in terms of the ratio of the pressure in an artificial ear to the pressure in a free sound field. Then he makes a correction for the magnetic receiver and the coupler and calls the result a "field calibration." Romanow,[10] of the Bell Telephone Laboratories, shows in this chart (see Chart 13), first, the "normal" amplification to be obtained from their vacuum tube aid. Note that the normal threshold line is at the bottom, that amplification begins to operate at about the 200 frequency level and yields over 60 dcb. of amplification at 300 frequencies. This shows the maximum performance. Particularly for perception deafness cases, this amplification will yield too much noise in the lower frequencies. The wearer of the aid says the noise is deafening. This is the recruitment factor. So into this instrument is put a device which the wearer can manipulate, to curtail the amplification of the low tones. This is shown in the chart in two lines, indicating the amplification curve when the tone discriminator is turned down "half" way, and again when it is turned down to "full." By this

device, the user can maintain the needed amplification in the high tones, and cut down the low tone magnification that troubles him.

Mr. Huth[11] kindly asked his engineer to send me the next chart (see Chart 14). The dotted line shows the low tones curtailed, the dashes show the high tones curtailed, and the unbroken line gives the maximum undiminished amplification. Please note that here again the vacuum tube instrument can, if desired, furnish a constant amplification of 60 dcb. between 300 and 4,000 cycles, and up to 50 dcb. at the 200 and 5,000 cycle extremes. In theory we now see how an 80

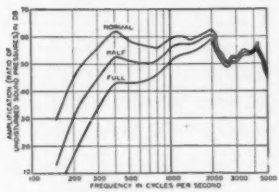


Chart 13

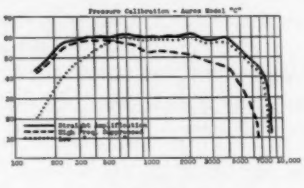


Chart 14

Field calibrations of a laboratory model of a vacuum tube hearing aid with different settings of the tone discriminator. Bell Telephone Laboratories.

dcb. impairment can be given useful hearing, for such a powerful instrument as this should cancel off all but about 20 dcb. of deafness in the important frequencies. Of course, the milder forms of deafness do not need these extreme amplifications.

We now proceed from this detailed consideration of the performance of individual hearing aids to a brief review of the best instruments now available in this country. Mr. Carter's material will give us this. The Council on Physical Therapy reports,[12] appearing in the *Journal of the American Medical Association,* furnish the external characteristics of each of the accepted instruments, its battery consumption, its response to articulation speech tests, and its amplification at threshold and at 45 dcb. above (to get the noise response). It should be remembered that the vacuum tube types give but little amplification at the low frequencies and begin really to help at around 500 cycles as indicated by these figures. The 1,024-2,048 range offers the most gain, dropping gradually again at 4,096 and more sharply above that frequency.

My overall summary furnishes the following average amplification at the normal threshold. These instruments are approved by the Council. There are now over 20 instruments on this approved list (see Chart 15).

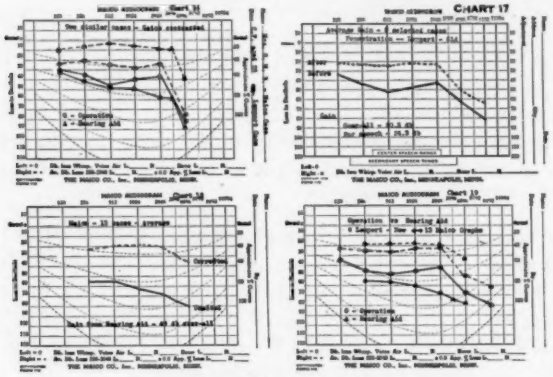
Instrument	Frequencies	Average Gain
Acousticon	256-2,048	34 dcb.
Aladdin	512-2,048	20 dcb.
Aurex	512-2,048	27 dcb.
Maico	1,000-5,000	30 dcb.
Otarion	512-2,048	35 dcb.
Radio-ear	512-2,048	34 dcb.
Telex	512-2,048	30 dcb.
Vacolite	512-4,096	30 dcb.

These figures do not give the extreme amplifications of the powerful instruments referred to above, but for the conversational range the average for this entire group gives the noteworthy average amplification of 30 dcb. Please remember these are officially listed performances reported by the Council of Physical Therapy.

Such are the facts as I have been able to assemble them. How shall we interpret these facts? Here one has to enter the field of supposition. The italicizing of certain facts and the omission of others may result in an erroneous emphasis. This we must strive to avoid. First, let us try to find in this material two cases that show a very similar deafness curve and compare the results obtained, one from an operation and one from a hearing aid. Chart 16, upper left, gives such a comparison. The circle shows the case on which the fenestration operation was done, the cross indicates the patient fitted with a hearing aid; the unbroken line shows the hearing in the unaided ear, the broken line shows the gain from the correction. The recorded initials on the side identify the patient in each instance. Here the two cases run almost together in the low frequencies, the fenestration case has a 20 dcb. better unaided hearing at 2,048 cycles, then the lines converge again. But the correction shows a 20 dcb. advantage for the hearing aid, in spite of the patient having less hearing at the start. I grant that either the operator or the manufacturer might be able to show a better graph than the one chosen, but this comparison impresses me as being worthy of our careful study.

Perhaps a fairer comparison is through the use of averages. Here the only overall average I have is the questionable gain enjoyed in Campbell's entire series. This would contrast unfavorably with any demonstrated gains from modern well fitted hearing aids.

With the exception of the above quoted claims of Hughson, Shambaugh and Lempert, I have found no carefully reported recent article which shows any considerable and consistent gains from operative interference. A monograph by Lempert in the July, 1938, *Archives of Otolaryngology* claimed a 20 dcb. operative gain in a series of 25 fenestration operation. This



Charts 16, 17, 18, 19.

was in a total of 3,280 major temporal bone operations by him up to that time, showing a very large experience with mastoid surgery. Last November's article brings his fenestration operations up to 375. Taking his selected series of eight from the preferred operative procedure of the most experienced operator in this field, let us compare them with the series of 13 furnished me by Mr. Watson.

The first chart (see Chart 17 — same as Chart 2) gives below the average preoperative hearing for these eight selected fenestra novovalis operations. Above is the broken line showing the average operative gain. This gives an overall gain of 20.3 dcb. and a conversational range gain of 24.3 dcb.

The next chart (see Chart 18) is a composite picture of Mr. Watson's 13 cases. Here the overall average for a two

octave narrower range is a 67 dcb. loss in the unaided ear, and only a 24 dcb. loss with the hearing aid on, or a corrected overall average gain of 43 dcb.

The third chart (see Chart 19) superimposes the Lempert composite picture (marked O) on to the Watson average (marked A). Of interest is the higher ultimate level of hearing in the hearing aid group. Of still greater significance is, first, the much greater spread between the two hearing aid lines (marked A) than between the two operation lines (marked O); second, as indicated by the lower unbroken A line, the more profound degree of deafness that is amenable to help with hearing aids, as against operative help. The Watson series starts with an average of 12.5 dcb. less hearing; and please remember that operators have many failures, while the percentage of failure where an expert has fitted a modern hearing aid is very low.

There is one more method for estimating the efficiency of a hearing aid for our patient, and that is its practical performance. It is an unusual agent who can give an impartial test at his agency, but the user can try it under three standard environments: in quiet conversation at home, in a noisy conversational environment, and in a quiet church, lecture hall or theatre. And music-lovers should test the response to music. The otologist can discover quite accurately its performance in a quiet environment by testing in his office the patient's distance capacity for conversation without and with the aid. Then he can use the West syllable test at four feet and record the percentage of successful replies.

For a practical application, let us consider a case whose air conduction shows a drop of 59 dcb. on the left and 65 dcb. on the right. His hearing capacity for a quiet conversational voice is at 10 inches with the unaided left ear, at 11 feet when wearing his old and very good carbon hearing aid, and at 25 feet with a vacuum tube aid.

A similar response is reported in Romanow's monograph. He points out that a hearing aid with a power output of 60 dcb. as shown in the Western Electric field calibration chart "will permit a person with a pure conductive type of hearing loss of 60 dcb. to hear excellently at a distance of eight metres from the speaker. To hear equally well without

this hearing aid, his ear would have to be within 1 cm. of the speaker's mouth." Consider the amplification necessary to give this distance increase from 1 cm. to eight metres, when the volume of sound varies inversely as the square of the distance: a 6,400-fold increase.

We have passed step by step through the evidence. It seems inescapable that a well fitted hearing aid offers more hearing, at less expense, with less hazard and less mental worry. Why then operate? There are several valid reasons for operating: *1.* Such a skilled procedure offers a challenge to the otologist. He wishes to compare well with the best; he prepares himself, then must find the patient to operate on. Also, there is the gamble that this particular patient will be the one that will enjoy the 35 dcb. gain. *2.* It takes advantage of an inborn trait in the patient that does not wish to advertise his own infirmities. Everyone with an encroaching deafness, and particularly the young adult, will go through almost any sacrifice and ordeal in an effort to escape wearing a hearing aid, if he considers it a public stigma and a confession of inadequacy and failure. The cure for this timidity and evasion is not an operation. Common sense and a kindly guidance have persuaded people to wear glasses, or false teeth. *3.* The wearing, the repair, the replenishing of these instruments are a nuisance and an expense. But the repeated and regular trip the fenestration case often makes to the surgeon, perhaps many miles away, is more taxing. And how about the ever-present suspense as to whether the bony window will close? *4.* The claim that an operation stops the advance of a progressive deafness seems to me the most significant of all the arguments presented. If this claim is valid, then an early discovery and a prompt operation will stop a progressing otosclerosis and give permanent relief. For instance, mothers who have somewhat injured their hearing with their first pregnancy may plan for another without fear, but I do not think this claim has been proven true. I learn with delight that 13 of Campbell's operated cases have shown an average gain of 1.8 dcb. during the past year. This may be significant. I would urge these operators to check back through their cases, and repeatedly, in order to decide this highly important question: as to whether a fenestration prevents further progression of an advancing deafness.

There are two suggestions to be derived from this review: *1.* He who recommends a fenestration operation must in fairness inform himself, and his patients, more accurately on the performance of a properly fitted modern hearing aid. They are becoming more flexible and more powerful year by year. *2.* The acoustical engineer must devise and promulgate a more accurate method of fitting an aid. The average agent is a salesman, and not particularly informed on acoustics. I have used the term "well-fitted" instruments. Most of you otologists have seen many illustrations of improper fittings. This is a task for a trained acoustical expert. The otologist is not such an expert. The otologist should examine every case that contemplates wearing a hearing aid, to be sure there is no local obstruction needing to be removed, or local infection that should be controlled, or systematic treatment that will improve the deafness. He should make the plaster ear mold. He should check the selected instrument's accomplishment, for the patient, unless he has previously worn one, has no basis for comparison. He should rely on the acoustical expert to make the careful selection and the detailed adjustments of the instrument. We can help both patient and manufacturer by insisting on such a careful fitting.

To what conclusion does this discussion bring us?

1. It prompts an admiring tribute to the skill and zeal of those surgeons who are striving so earnestly to help hard-of-hearing patients.

2. It contrasts the average gains from selected cases reported by Shambaugh, Lempert and Campbell, of 25.7 dcb. and 24.3 dcb. and 21.8 dcb., respectively, against an average gain of 43 dcb. in a selected series of hearing aid fittings. Such selections can lend themselves to giving exaggerated impressions, and to that extent are not reliable, but the ratio of 23 to 43 may prove to be fairly correct.

3. It suggests that in reporting the results from the fenestration procedure, the bad should be reported with the good, in a consecutive series. The patient has a right to know what his average chances are, as well as what a selected group can show. In the reports reviewed, only Campbell's results permit a fair appraisement. A similar consecutive series, by acoustical engineers, would give further valuable help. We

do have the Council of Physical Therapy figures giving an average gain of 30 dcb. for all the hearing aids here listed.

4. It asks for further study of the important claim that the fenestration operation stops the progression of an advancing deafness.

5. We know that those less severe cases best suited for operation are just the cases that are most easily helped by a hearing aid. The yearly increasing efficiency of these instruments gives yet more assurance of helping the very severe forms.

6. It finds that a well-fitted modern hearing aid can give greater amplification than the fenestration operation, and to an acoustically wider group of hard-of-hearing individuals; and, in spite of the nuisance factor, at less cost in expense and in pain and in worry.

7. It urges yet greater effort and zeal on the part of the acoustical engineer in the creating and calibrating and adjusting of these truly wonderful instruments of precision.

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SALIVARY CALCULI. REPORT OF 31 CASES.*

DR. SAMUEL D. GREENFIELD, Brooklyn.

The occurrence of calculi in the salivary glands is fairly common. Ordinarily the diagnosis and treatment should offer no serious problem; however, occasionally one encounters a case for the proper management of which one must be cognizant of some very important and fundamental facts. These pertain primarily to a knowledge of the anatomy of this region and the surgical technique required for extirpation and, only secondarily, to the diagnosis and localization of the stone.

The opinions expressed here are based upon an experience of 31 cases of salivary calculi. Of these, 28 involved the submaxillary gland, two the sublingual gland and one the parotid gland. This incidence coincides in general with that found in the literature, there being a great preponderance of submaxillary calculi as compared with the other salivary glands. Owing to this, and the fact that whatever difficulties and complications I have had in the surgical removal have applied solely to calculi of the submaxillary gland, I shall confine my discussions exclusively to calculi occurring in this locality.

There are a number of factors which seem to contribute to this great predisposition of calculus formation in the submaxillary gland. First, it is definitely known that the secretion of this gland is more viscid than that of either the parotid or sublingual glands. Consequently, with the slowing up of the normal rate of flow of the secretion, foreign bodies are dislodged with greater difficulty. Second, the greater portion of the gland is situated at a lower level than the duct itself. This obviously tends to slow up even more the flow of saliva from the gland to its point of exit below the tongue. Gravity, which would ordinarily aid the spontaneous expulsion of these calculi in many instances, cannot, therefore,

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*Read before the New York Rhino-Oto-Laryngological Society, February, 1941.

Read before the Ear, Nose and Throat Section of the Kings County Medical Society, November, 1941.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, July 1, 1942.

influence the process in this locality. Third, the duct is the longest of all the salivary ducts and with its upward slope to the frenum of the tongue, stones cannot be propelled through it with the same ease as in the other glands. Lastly, the opening of the duct, located as it is at the floor of the mouth behind the incisor teeth, becomes exposed to the trauma incidental to mastication. Foreign bodies can therefore be forced into the duct at this site, the commonest of which is the tartar of the teeth.

PATHOLOGY.

According to Brophy, calculus formation in the salivary apparatus, as elsewhere, is caused primarily by infection. Salivary calculi are composed essentially of phosphates and carbonates of calcium. When these salts are dissolved by acids a residue of inorganic material consisting of bacteria and their products remains. In many instances a distinct bacterial nucleus is noted. Whether the stone found in the duct is formed there, or whether the process originally begins in the gland is questionable.

Since the process is constructed upon an inflammatory basis, the dividing line between calcarious degeneration of a chronic inflammatory process and calculus formation is arbitrary. When a stone is in the duct it is conceivable that a cluster of bacteria or a small foreign body is lodged there. Following an inflammatory reaction, salts are deposited upon this framework. As the saliva pours over it the process continues until the stone becomes of sufficient size to cause a pronounced reaction.

In the majority of cases the calculi conform more or less to the shape of the structure in which they are lodged. When found in the duct they are usually smaller, vary in length and are most often cylindrical in shape, tapering at one or both ends. The surface of the stones found in the duct is usually smooth.

With calculi in the gland substance, a similar reaction occurs as has been described in the case of the duct; however, the stones found in this locality are apt to be larger and assume as a rule a more globular shape. The surface of the stone, in contradistinction to that found in the duct, is irregular and cobbled in character.

It should be noted that calculi may be single or multiple. In the latter instance they may be found in the gland and the duct simultaneously. I have had two such cases.

ANATOMY.

The submaxillary gland is situated below the angle of the jaw in the anterior part of the submaxillary triangle of the neck. It is irregular in shape and weighs about 8 to 10 gm. It is covered by skin, platysma and deep cervical fascia and rests upon the mylohyoid, hyoglossus and styloglossus mus-

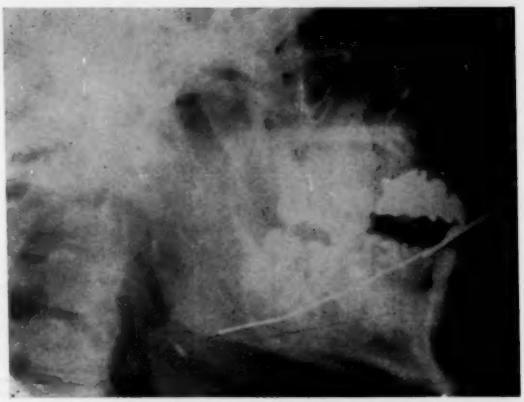

Fig. 1. Probe extending into a normal submaxillary gland.

cles. The duct is over two inches in length and extends from the gland beneath the mylohyoid muscle along the floor of the mouth external to the sublingual gland and opens on a summit beside the frenum of the tongue. On the hyoglossus muscle it lies between the lingual and hypoglossal nerves. At the anterior border of the muscle it crosses under the lingual nerve and is then placed upon it.

This close relationship of Wharton's duct to the lingual nerve is of utmost importance to the surgeon endeavoring to remove calculi situated in this portion of the duct. From my experience it seems that this is a favorite site for duct calculi. Perhaps there is a narrowing of the lumen at this point occasioned by the nerve as it crosses the duct.

This close proximity of the duct to the lingual nerve makes it evident that incision directly over the latter, supplemented

by the surgical exploration necessary to extirpate the stone, may traumatize and even sever the nerve. This is made even more hazardous if excessive bleeding occurs. Furthermore, if in the removal of larger calculi situated in the gland proper one resorts to sharp dissection, danger of injury to the nerve is even greater.

I am stressing this particular point because in three of my earlier cases, one with a large stone in the gland and two with calculi in the duct, the lingual nerve was injured and there resulted complete loss of sensation on the corresponding half

Fig. 2. Stone in the hilus of the submaxillary gland.

of the tongue. As a result of this the patients in the act of mastication bit into the tongue unknowingly and there was extensive ulcerations at the margin of the tongue. In one case a large portion of the latter was chewed away. Sensation finally returned in all three, but in one patient about one-third of the musculature was destroyed. In this case three months elapsed before normal function was re-established.

SYMPTOMATOLOGY.

The symptoms will be governed to a great extent by the size and location of the calculus. A small stone in the duct may cause intermittent enlargement of the gland, whereas a large stone will produce complete obstruction. Calculi situated in the gland do not as a rule cause obstructive symptoms and may exist without any signs.

The following groups of cases have been noted:

1. Asymptomatic Type: Cases with stones in the glands. These are patients in whom there exist no symptoms referable to all the salivary apparatus. The stones are discovered accidentally. I had two such cases referred to me by dentists. In each the patients complained of pain referred to the teeth and jaw. Upon X-ray a large shadow was discovered below the angle of the jaw. In both instances examination disclosed no changes in the floor of the mouth, but Wharton's duct showed a reddened, elevated osteum.

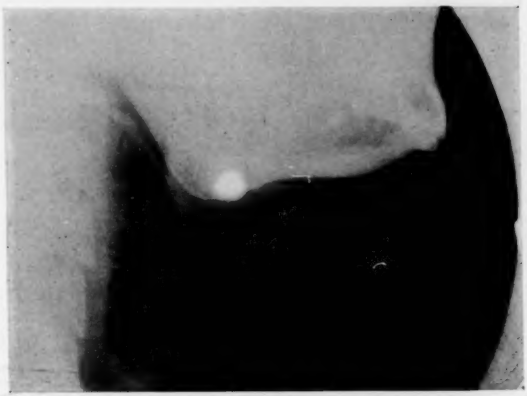

Fig. 3. Stone in the submaxillary gland.

2. The Chronic Type: Cases with stones in the gland. These patients present a palpable, moderately tender and chronically enlarged submaxillary gland. There may be some increased swelling during activity of the gland at meal time. Occasionally there is some discomfort experienced during deglutition. Palpation reveals definite tenderness along the floor of the mouth and especially upon pressure against the gland. Occasionally one can palpate the stone. The opening of Wharton's duct is definitely reddened and elevated as compared with its fellow on the opposite side.

3. The Classic Type: Cases with stones in the duct. These comprise by far the majority of the cases. Here the calculus is small and is located in some portion of the duct. During meal time or at the sight of appetizing food there is increased

activity of the gland. Owing to partial obstruction occasioned by the presence of the stone, the outflow of saliva cannot keep pace with the rate of production and consequently the dam-

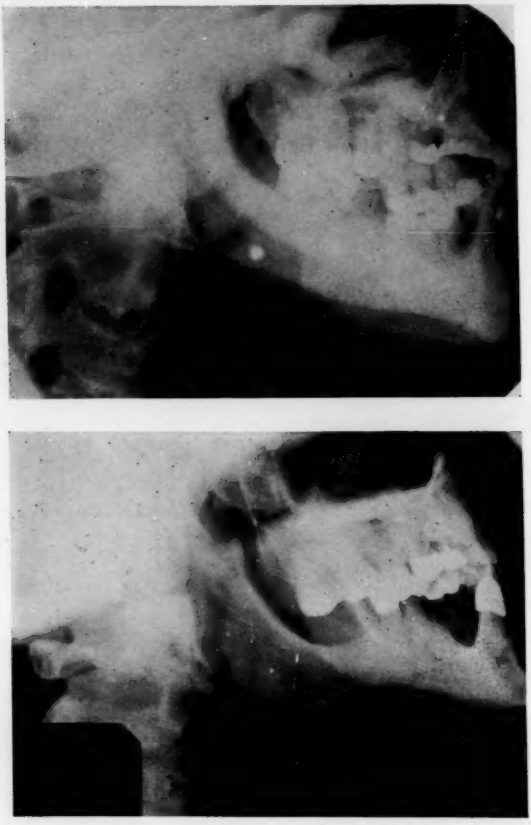

Fig. 4. Stones in Wharton's duct.

ming back causes swelling of the gland. When the swelling is at its height it may be accompanied by pain in the submaxillary region. Some difficulty is noted upon deglutition. The swollen gland is tender and pressure along the course of the duct, especially over the site of the stone, elicits exquisite tenderness. The opening of Wharton's duct on that side is reddened and prominent. The swelling lasts a variable time,

from 15 minutes to an hour and longer. As soon as the secretion in the gland lessens, the swelling gradually diminishes and the symptoms abate, only to recur again at the next meal time. These attacks may continue over a period of weeks and even months.

4. The Obstructive Type: Cases with stones in the duct. These are cares that have been in Group 3 for some time; *e.g.*, with the intermittent swelling of the gland due to the presence of a calculus in some part of the duct. Owing to the

Fig. 5. Stone in Wharton's duct shown on plate but not visible on lateral view.

increased enlargement of the stone or to narrowing of the duct due to inflammatory changes, or perhaps to both factors, the obstruction becomes complete and the swelling of the gland does not subside between the attacks. Now the gland is permanently and visibly enlarged. All the signs and symptoms noted in Group 3 are present, but in a more intensified character. The gland and duct regions are tender and there is edema of the tissues at the floor of the mouth on that side. The opening of Wharton's duct is angry red, puckered and edematous. Pressure from below the jaw against the gland discloses a mucopurulent secretion emanating from the opening.

5. Acute Infectious Type: Cases with stones in the duct. These are patients who, without any previous history of symp-

toms referable to the salivary apparatus, are suddenly seized with pain in the submaxillary gland area. This becomes rapidly swollen and tender and may extend forward under the mandible to the midline and well beyond it. Deglutition becomes painful and trismus is present. The tissues on the floor of the mouth on that side are markedly edematous and elevated. Movement of the tongue is restricted and the patients appear acutely ill. The temperature is usually elevated and a diagnosis of a suppurative adenitis and even a Ludwig's angina is made; however, examination of Whar-

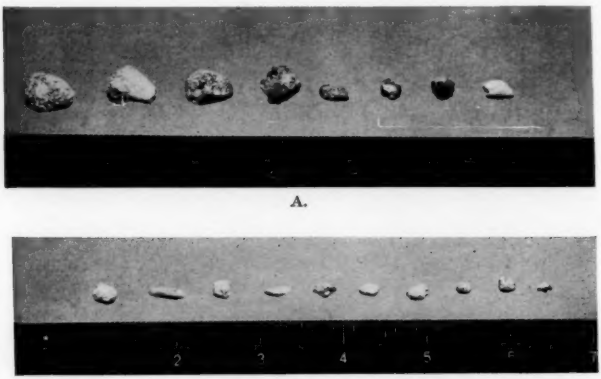

Fig. 6. Calculi removed from the submaxillary salivary apparatus. (A) Stones from the submaxillary gland. (B) Stones from the submaxillary duct.

ton's duct discloses an angry red, elevated osteum. With pressure against the gland one can express a mucopurulent secretion. These latter findings immediately indicate the diagnosis. X-ray will disclose the stone and probing of the duct will reveal its exact location. I have had several of these cases and it is dramatic to see how quickly the symptoms abate following internal incision and removal of the calculus.

Diagnosis: In the majority of cases there should be little difficulty in the diagnosis. This is made upon the history of symptoms referable to the salivary apparatus. Examination discloses the enlarged and tender gland, and palpation of the floor of the mouth oftentimes reveals the location of the stone. Pathognomonic, however, are the visible changes seen in the opening of Wharton's duct. A normal duct has an osteum

that is almost invisible and difficult to probe. X-ray will usually confirm the diagnosis. With a fine lacrimal probe one can oftentimes determine the exact location of the calculus.

Treatment: All calculi situated in either the duct or the gland can and should be removed via the oral route. I have never found an external approach necessary and I cannot imagine any situation in which one must resort to this method. There are some surgeons who advocate the removal of the entire gland in all cases where the calculus is of appreciable size and located in the gland proper. The claim is made that if this is not done, recurrence of the calculus is inevitable. I cannot share this opinion. In only one instance did I find it necessary to remove a second calculus. But I do not believe this was an actual recurrence. This patient was free from symptoms for only six weeks after the first operation. The calculus I removed at the second operation was much larger than the first one and it is my conviction that there were two stones present originally. This was one of my very early cases and the patient did not receive the benefit of an X-ray. I failed to look for a second stone, having been content with finding one.

In cases where infection and suppuration of the gland occurs in connection with the stone, I do not feel one is justified in removing the gland immediately. Internal incision and the establishment of drainage is all that should be attempted at this time. Only in those cases in which the infection recurs is one justified in extirpating the entire gland. In the latter instance the structure of the gland becomes so altered that its function is destroyed and remains a constant menace to the patient.

Operation: The operated area is painted with a weak solution of tincture of iodine. A small pledget of cotton saturated with 2 per cent solution of pontocain is placed under the tongue over the area of Wharton's duct and the submaxillary gland and left in place for from five to 10 minutes. The floor of the mouth is then infiltrated with a small amount of 1 per cent novocain solution containing adrenalin. After determining where the stone is located by palpation, a small incision through the mucous membrane is made over this area and with blunt dissection one proceeds to separate the tissues in the direction of the calculus. It is advisable constantly to

palpate the stone to make sure one does not deviate in the wrong direction. I have found a blunt pointed nasal dressing forceps to be the safest and most suitable instrument for the dissection.

Working downward toward the calculus, one soon feels the stone or a small, white edge of it becomes visible and the remainer of the operation is then a simple matter. If bleeding becomes troublesome and this occasionally occurs, it is best to pack the cavity with adrenalin and wait a few minutes for the bleeding to cease. If a larger vessel is opened, it is better to grasp and ligate it. After the stone has been removed, one should make certain that a second calculus does not exist. Having determined to one's satisfaction that this is not the case, the operated area is cleansed with an aqueous merthiolate and the wound left widely open.

Adequate light and the use of suction will greatly facilitate the operation. It requires much patience if one is to succeed with a minimum of trauma. As I have mentioned before, aside from the initial incision of the mucous membrane, sharp dissection should not be used in order to avoid injury to the lingual nerve.

As a rule there is little postoperative reaction. Some pain may be experienced in the operated area for a few days and occasionally some swelling of the submaxillary gland, but these symptoms quickly subside. An ice bag to the side of the neck, an antiseptic mouth wash and a sedative for the discomfort is all that is required. I have had no serious complications resulting from infection. Since the advent of sulfanilamide, however, I have used the drug for a few days following operation.

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RHINOLOGY IN CHILDREN, RESUME AND COMMENTS ON THE LITERATURE FOR 1941.

DR. D. E. S. WISHART, Toronto.

In this resumé of the literature pertaining to rhinology in children, the same journals have been covered and the same order of discussion has been followed as in the previous reviews. This policy has pleased numerous readers. Effort has been made to present each writer's ideas fairly. Where an article has been omitted such omission has been an oversight and if brought to the reviewer's attention the article will be reviewed next year. One such inclusion will be found in what follows:

GENERAL ARTICLES ON ACCESSORY SINUS DISEASE IN CHILDREN.

Wachsberger[1,2] writes that infections of the sinuses in infancy and childhood hold a greater potential danger than such infections in adult life. Infection occurring during the period of pneumatization of these structures may permanently arrest this process. Lack of normal pneumatization may lead to lifelong chronic infection.

Infection originating in the sinuses may attack structures (such as surrounding periosteum and bone) by direct local extension or by transmission by way of the lymph channels to the lower levels of the respiratory system. A common mode of extension is by continuity of tissue to the bronchi and lungs. Chronic bronchitis, frequently bronchiectasis and occasionally pulmonary abscess may be traced to nasal infection.

The mechanical importance of free nasal airways must be emphasized. Ventilation of the sinuses depends on alternate changes in air pressure, negative with inspiration and positive with expiration. Any interference with this mechanism may result in obstruction to the ostiums, retention of secretions within the sinuses and possible suppuration.

Maxwell[3] states that a review of literature on acute fulminating sinusitis reveals various explanations of the devel-

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, Aug. 1, 1942.

opment of sinusitis after swimming. The divergent opinions regarding treatment of this condition are recorded.

Data from the record of 13 patients who in the past 10 years were admitted to the University of Michigan Hospital with acute fulminating sinusitis subsequent to swimming are cited and briefly analyzed.

It is proposed that the cause of acute fulminating sinusitis after swimming is the introduction of virulent organisms into a normal sinus which is completely unprotected and has not had the advantage of preforming any local barriers to the infectious process.

The recorded instances of rapidly appearing signs of intracranial complications in acute fulminating sinusitis make it seem likely that in these cases the intracranial infection is established by the time frank suppuration in the sinus cavity appears. On this basis the rationale of attempting to drain an acutely infected frontal sinus within the first two or three days to prevent intracranial complications is questioned.

It is suggested from the series of cases cited that the early complications of this disease are more apt to be intracranial than calvarial.

Because of the staphylococcic origin of most of these fulminating infections, the use of sulfathiazole at the onset of the symptoms is urged.

He cites a case in point in a boy, age 9 years. In the absence of head cold or other probable cause, intense pain over the root of the nose, left chest and left side of the forehead developed 24 hours before admission to the hospital. These symptoms were associated with prostration and a temperature of 103° F. Within 24 hours, the left eye was swollen shut, and there was intense edema of the nasal mucous membrane on the left side associated with a thin serous exudate in the left middle meatus. Staphylococcus aureus was the invading organism, and sulfathiazole in adequate amounts was administered for three days. The swelling edema and most of the tenderness over the cheek, root of the nose and forehead disappeared in 48 hours. Thick purulent exudate which appeared in the left side of his nose during the second day was no longer in evidence at the end of a week.

COMPLICATIONS OF ACCESSORY SINUS DISEASE.

Stevens[4] reports three cases of osteomyelitis of the frontal bone classified after the method of Williams and Heilman. Two of Stevens' cases were in children.

He states that the management of such cases is dependent on: Drainage and the establishment of the classification. Careful removal of all the infected bone. Symptomatic treatment, including intravenous administration of dextrose solution, blood transfusion and the administration of sulfanilamide or one of its less toxic derivatives. If the infection is due to a streptococcus of the hemolytic variety, human scarlet fever convalescent serum is of apparent value. If the infection is due to one of the types of pneumococcus, the corresponding type of pneumococcic serum should be used, with the possible addition of sulfapyridine.

Thoeny[5] reports a case of cellulitis of the face with osteomyelitis of the frontal bone as a complication in a boy, age 6 years. It is presented as an example of one of the dangerous complications of infection about the face.

The boy had never had any evidence of sinus disease, had no trauma, had not been swimming, and was in vigorous health. A day or two before admission he had developed a sore spot on his nose and this extended rather rapidly so that when first seen he had a well developed cellulitis, originally on the nose, but extending by this time up over the forehead and showing marked edema of both lids.

The infection began streptococcal but staphylococcus was found early and remained as the offending organism.

Conservative methods were chosen; first, because the infecting organism was considered low-grade; and second, because the areas of destruction did not tend to spread or coalesce. Rapidity of extension was estimated by frequent Roentgenograms.

One of the most fatal complications occurring in otolaryngology is that of septic thrombophlebitis of the cavernous sinus. Grove surveyed the literature and came to the conclusion that septic thrombophlebitis of the cavernous sinus was practically 100 per cent fatal. Since the introduction of chemotherapy isolated case reports of recovery are beginning

to appear in the literature. In a well charted and illustrated article, Schall[6] reports three consecutive cases that fulfilled the diagnostic criteria of Eagleton of septic thrombophlebitis of the cavernous sinus of the anterior type which ended in recovery after treatment by the combination of chemotherapy and heparin.

One of the patients was a boy, age 9 years, whose lesion arose secondary to a furuncle in the nose.

Lyons states: "There is reason to believe that staphylococcal bacteremia usually arises from foci of septic thrombophlebitis in and around areas of suppuration." Such a conception indicates that the attack upon any staphylococcal bacteremia should attempt to prevent the extension of septic thrombi as well as to destroy the bacteria.

It is contended not that heparin has any influence on a thrombus that has already formed but that, by increasing the fluidity of the blood, it may prevent the extension of that thrombus. Sterilization of the blood and the thrombus converts a septic process into an aseptic one, so that the combination of these drugs seems to be indicated.

Sulfathiazole, given in doses sufficient to maintain a blood level of 5 mg. per 100 cc. and continued for a long period after administration of the heparin has been discontinued, has been the chemotherapeutic agent of choice. Experience with sulfadiazine indicates that this may prove to be the present drug of choice.

Although the patient reported on was an adult, readers of this resumé are directed to the report by Ershler and Blaisdell[7] on massive hematuria in cavernous sinus thrombosis which followed the use of heparin.

The patient, who recovered, had a complication — namely, profound hematuria — which persisted in spite of daily blood transfusions. There was evidence to show that this finding was due to the hemorrhagic diathesis artificially produced by the administration of heparin. Almost immediately after the heparin was discontinued the urinary bleeding stopped, the anemia responded to treatment and the clotting time returned to normal.

The authors point out that the intravenous administration of heparin produces a significant prolongation of the coagu-

lation time, which is in fact a hemorrhagic diathesis. Consequently there may be produced dangerous bleeding in vital areas of the body. This patient presented profound renal bleeding, from which there were no serious sequelae. Bleeding from cerebral, pulmonary or coronary vessels might conceivably result in disaster.

TREATMENT OF ACCESSORY SINUS DISEASE.

Brown[8,9] discusses in some detail the treatment of sinusitis in children and adults, stressing the salient features of general treatment in the acute phases. These center about efficient drainage, the technique of instilling shrinking solutions, measures calculated to bring comfort, and drug therapy. Brown includes some comments on immunotherapy and chemotherapy.

Patients with sinusitis in the subacute phases, especially when free from pain and afebrile, respond best to thorough nasal shrinkage followed by gentle irrigation of the nose with warm Ringer's solution or to displacement treatment.

Irrigation of the antrum is contraindicated in the acute stage as a rule, and beneficial in the subacute. When acute maxillary sinusitis is due to dental pathologic conditions, without extraction, the antrum should be irrigated. When the acute process has subsided, the offending dental condition should be eradicated. Antral infection following dental extraction is best treated by irrigation through the socket if the latter connects with the antrum, but if no connection exists, the irrigation should be carried out through the nose.

The ethmoid and sphenoid sinuses, as well as the frontal sinuses, should respond to intensive shrinkage, which technique must be carefully and persistently carried out. If untoward symptoms arise, especially those indicating extension to the eye and/or intracranial structures, it is imperative to institute free drainage immediately, as well as to remove as thoroughly as possible all infected cells. The only logical approach is by the external route.

In the treatment of chronic sinusitis, careful examination of the system and regions in general and of the sinuses in particular is called for, including Roentgen examination, allergic tests and metabolic studies. Local structural faults

in the nose should be corrected, infected lymphoid elements in the pharynx removed and the nutrition of the patient balanced.

Chronic maxillary sinusitis should be treated by irrigation or if necessary by the making of an antral window. The presence of hyperplastic mucosa should suggest a check-up for the detection of allergy. In cases in which there are suppuration, hyperplasia and polyposis, a Caldwell-Luc operation is indicated. The same procedures should be carried out in those cases in which sinusitis is due to dental pathologic conditions.

Chronic disease of the ethmoid labyrinth may clear up when the antral disease is eliminated or after displacement treatment. If these measures are unsuccessful an intranasal ethmoidectomy, with preservation of the middle turbinate, should be the method of choice. Failure to achieve good results might indicate the external approach.

Chronic disease of the sphenoid sinus will be helped in many instances by displacement treatment or by irrigation of the sinus through the natural opening, and if these measures prove unavailing, the making of an intranasal opening into the sinus should be undertaken.

Chronic frontal sinusitis calls for intranasal ethmoidectomy. The remaining portion of the nasofrontal duct should not be interfered with. When orbital infection, fistula, osteomyelitic changes and other symptoms suggesting intracranial involvement become manifest, an external operation is indicated. In the operation no vestige of mucosa should be left and no bone should be uncovered by periosteum.

The author concludes his paper with this summary:

1. A careful general investigation of the patient's physical condition is advised in all types of sinusitis. This may disclose important underlying etiologic factors that may avert unnecessary local treatment or surgery.

2. No surgical treatment should be undertaken during the acute stage unless urgency demands intervention.

3. Conservation of the nasal mucosa is essential in all sinus surgery.

4. The early recognition of serious complications with the proper treatment is imperative.

5. Adequate drainage in both acute and chronic sinusitis is the greatest essential treatment.

Youngs[10] reports the results of Roentgen ray treatment of 75 patients with chronic sinusitis. Thirteen of these were age 14 years or less. No definite conclusion as to the type of case in which Roentgen therapy can be used with assurance of success has been reached, although he feels it to be the treatment of choice for children. He noted no harmful effects from the proper application of Roentgen rays in the treatment of sinusitis. Many of the patients have been observed continuously for more than a year after treatment.

That intranasal immunization has a sound scientific basis, the *British Medical Journal*[11] comments editorially, has been proved by a number of observations during the past few years and the method has been shown to be applicable to a wide variety of antigens. Fraser, Davey and Halpern,[12] in Canada, have further studied the antitoxin response in children and adults treated intranasally with concentrated and purified diphtheria toxoid, the preparations used having Lf. values of 900 and 850 per cc. The technique consisted of soaking a small pledget of absorbent cotton wool in 0.5 cc. of toxoid and inserting it through the anterior nares until it rested between the septum and the anterior end of the inferior turbinates. The pledget remained in the nose from 15 minutes to six hours. The antitoxin titre was tested before and after immunization, and though the individual response varied greatly, 83 per cent of the entire group showed a good response. These workers, however, regard intranasal instillation as more suitable for reinforcing antitoxin immunities than for primary inoculation.

The dangers of nasal immunization are pointed out in an annotation in *The Lancet*.[13]

Our snuff-taking forefathers knew the value of pleasurable stimuli applied to the nasal mucous membrane. The modern variant, the nasal instillation of immunizing stimuli, is chiefly linked with the name of Claus Jensen. There is ample evidence that toxins and toxoids are thus absorbed and do immunize or stimulate immunity in those already immunized.

Most of the work has been done with diphtheria prophylactic, but Gold, in the United States (quoted by Firor), has applied tetanus toxoid successfully in this way, and the nasal route has also been used for introducing pertussis antigen. As Jensen remarked, a considerable number of children fail to return for the second or third injection of diphtheria prophylactic; if the mother in the home could easily apply prophylactic effectively and harmlessly by the nasal route, a considerable advance in voluntary immunization would be achieved. When the procedure was first introduced, caution suggested reservation of judgment, for the method gave no control over the amount of antigen absorbed, and it seemed possible that direct application to the mucous membrane might engender trouble in the sinuses, or what would be just as irksome to the public-health administrative, a belief among the public that fortuitous infections were caused by the nasal application.

Fraser and his colleagues in Toronto applied pledgets of cotton-wool well soaked with diphtheria toxoid and obtained good immunity, but were disappointed that there was a proportion of failures in reimmunization. Jensen was little troubled by reactions. Bousfield varied Jensen's directions by using a fine spray. Of seven volunteers, one experienced disabling shortness of breath and was therefore excluded after the first spraying. Of the remaining six, four suffered uncomfortable reactions after the second spraying, two being confined to bed the next day, one with vomiting. Since 1935 all probationary nurses in the mental hospitals of Copenhagen have received a subcutaneous injection of toxoid, followed after an interval by three successive nasal applications of toxoid. In 1938, Anderson noticed that an unusual number of nurses needed treatment for rhinitis. Of 236 nurses examined, 152 showed no symptoms reasonably attributable to the instillations, 84 traced their nasal troubles to the instillations, in 71 the affection having begun immediately after the treatment, and in 13 a few weeks afterwards; 38 suffered from a temporary disturbance only, but 46 showed chronic crust formation, small hemorrhages, coryza and sinusitis. Anderson was not inclined entirely to exculpate the Jensen procedure. Obviously further information is needed but it seems that nasal immunization is not to be taken in hand lightly.

Seventeen of the subjects who provided the material for the earlier reports on antiseptic snuffs by Delafield and Straker[14] were examined for a further period of 20 weeks. Nasal swabs, one from each nostril, were taken as before on three consecutive days each week and the technique of the examination was, in every respect, identical with that previously described.

The snuffs which were the chief subjects of study had the following compositions:

Sulfathiazole snuff:

a. 10 parts by weight of sulfathiazole,
90 parts by weight of magnesium carbonate.

b. 33.3 parts by weight of sulfathiazole,
66.6 parts by weight of magnesium carbonate.

c. 50 parts by weight of sulfathiazole,
50 parts by weight of sulfapyridine.

To these 1 per cent of menthol may be added according to individual taste. If children are to be treated it would probably be best to omit the menthol.

General impression obtained is that *b.* and *c.* are better than *a.* but that *b.* and *c.* are equally effective.

The subjects have taken the snuff six times a day either by the classic method or by sniffing it from one corner of a small triangular piece of waste paper. The amount thus taken per day has been weighed. Twelve pinches, or a day's supply, of the sulfathiazole 33.3 per cent in magnesium carbonate weighs 0.075 gm., representing an intake of less than 0.6 gm. of sulfathiazole a week. No toxic symptoms were ever observed even after many weeks of snuff-taking.

The study was made of the amount of sulfathiazole taken up by a nasal swab. Swabs from both nostrils of the 17 subjects were examined chemically about two hours after the last snuff-taking. In 11 out of 34 swabs, sulfathiazole was demonstrated in amounts ranging from 0.03 to 0.29 mgm. As the presence of the drug on the nasal swab might affect the bacteriological finding, all subjects were directed not to take any snuff during the 12 hours preceding swabbing,

which was carried out at 10:30 A.M. After this instruction no sulfathiazole was demonstrated on the nasal swab.

The authors make the following conclusions:

1. An antiseptic snuff containing sulfathiazole is effective in causing an extreme reduction in the number of staphylococci in nasal carriers of this organism. The carriers are not cured, as the organisms reappear within a few weeks of the cessation of treatment.

2. It is effective in the cure of carriers of Hoffmann's bacillus and is likely to prove effective in the treatment of chronic nasal diphtheria carriers.

3. It may be effective in the treatment of nasal hemolytic streptococcus carriers.

4. It may be of value in treatment of the carriers of meningococci.

5. It is worth further trial in cases of the common cold in which it tends to affect the course of the disease favorably, although it is not a preventive.

6. There is no evidence that it affects the nasal carriers of pneumococci.

NASAL ALLERGY.

Henderson[15] points out that in the field of allergy, which is new and but partially explored, we must be critical and constantly on guard, lest, to paraphrase Montaigne, "we lack the power to weigh things by themselves and that we be not easily misled by chance appearances."

The allergy he discusses is that in which an individual reacts to a normal substance in an abnormal way. Manifestations of allergy may develop in a sensitized person upon exposure to the specific allergen to which sensitization has been acquired. The physiology of allergy and anaphylaxis is described as a twofold reaction; first. a constrictor effect on smooth muscle tone; and second, capillary dilatation and edema. This accounts for the bronchospasm, the edema of the bronchial mucosa, and stimulation of the mucous glands in asthma. Further, this capillary effect, first vasodilatation and engorgement, then exudation from increased permeabil-

ity, is of course responsible for the nasal symptoms of hay fever and allergic rhinitis, causing fullness and obstruction, sneezing from irritation of the nerve endings, and then rhinorrhea.

He says that there are five important points which are the criteria of the allergic state: *1.* the history and the nature of the complaints. *2.* The history usually of other allergic manifestations at some period. *3.* Eosinophilia. *4.* Positive protein tests. *5.* The family history.

In no other class of patient is it more requisite to take a detailed history. The history gives the picture on the cover of the jig-saw puzzle-box. The next job is to find the pieces and fit them together and it may take time and patience.

He emphasizes the dicta of Munro Cameron: "These allergic types are in their histology as different as possible from those of acute inflammation as ordinarily found. Eosinophil cells can, of course, be found in any inflammation, especially in the gastrointestinal tract; but this nasal invasion of these cells amounts to an infiltration to the exclusion of the normal inflammatory cells, and the edema of the matrix is equally distinctive and only just less impressive." The nasal discharge and the sputum may also share in the eosinophilia.

And yet there are nose and throat surgeons who continue to display undaunted pertinacity in removing polyps *ad infinitum,* and, alas and alack, tonsils for the relief of the allergic cold.

In allergy due to pollens and other inhalants the nose and the accessory sinuses may bear the brunt, the eyes often sharing in the irritation, but sooner or later the bronchial tree becomes affected and asthma, with or without associated upper-respiratory symptoms develops.

An important question is. "When is a cold allergic, or when has your allergic patient got a cold?" The allergic cold usually commences suddenly without prodromata or malaise; sneezing, stuffiness and rhinorrhea prevail for a longer or shorter time and terminate rather abruptly, the discharge never assuming a mucopurulent character unless there is also infection. Postnasal discharge, if present, is not yellow or heavy, sinus pain is unusual, and other members of the household

are not affected. The trouble is that allergy and infection so frequently combine in the same case, the boggy edematous mucous membrane of the allergic nose being open house for the pathologic bacteria hovering around.

In true hay fever the symptoms are of course seasonal, in Spring, early Summer, and late Summer or Fall, due to the pollens of trees, grasses and ragweed, in reverse order of importance. It is not uncommon to find cases that each year seem to drag on longer than the pollen season, due to super-added infection, or to other allergenic inhalants or foods keeping up the symptoms. A common report from adequately treated pollen cases, too frequent to be mere coincidence, is that their usual winter colds have been strikingly benefited. As I understand it, the insulted mucous membrane becomes edematous and swollen, drainage is incomplete, the accessory sinuses share in this edema, as may be demonstrated by lipiodol as part and parcel of the allergic reaction; and then there is super-added infection and the process is perpetuated.

Many hay fever subjects have an associated mild wheeze, and no inconsiderable number of asthmatics originate as hay fever, though they may later cease to be seasonal, due to other complicating allergic or infectious factors. There is ample reason for believing that pollinosis uninfluenced by treatment leads to chronic thickening and polypoidal change in the nasal and accessory sinus mucosa, and this is prone to become secondarily infected in the course of time. It is customary nowadays to speak about reversible and irreversible reactions. The first is edematous or allergic swelling which subsides when the irritant ceases to act or the patient is desensitized to it. The irreversible reaction is one which does not subside and may call for surgery to eradicate it.

There is no doubt that sensitivity to food occupies an important place in the etiology of allergic states; however, Henderson states that as a rule the rôle is a secondary one and elimination diets have not aided materially.

Allergic headache and allergic migraine, as well as allergic epilepsy, probably do exist, but it is doubtful if as commonly as certain enthusiasts have led us to believe.

Drug allergy is not infrequently met with; aspirin, quinine, codeine and morphine have accounted for angioneurotic

edema, intractable asthma and severe dermatitis. Sensitivity to ephedrine is not unknown. He sounds a warning against the administration of morphine, particularly if combined with atropine, for "status asthmaticus" especially where there is cyanosis and the bronchial secretion is not free. These cases are often associated with the presence in the bronchi of casts or plugs of tenacious mucus; the morphine abolishes the already weakened cough reflex, while the atropine further inspissates the plug so as to enhance the state of asphyxia, and many asthmatic deaths are thus brought about.

On the basis of Hansel's observations,[16] as well as those of leading observers, it is evident that typical and atypical allergy in the upper respiratory tract may be overlooked if adequate care and time are not directed to the establishment of the diagnosis. A correlation of the clinical history, the local findings and the cytologic examination of the secretions establishes the diagnosis in most cases. Further consideration, however, must be given to Roentgen, bacteriologic and other laboratory procedures.

In children, allergy of the upper respiratory tract is often overlooked, and such patients are frequently subjected to removal of the tonsils and adenoids for the relief of frequent colds and bronchitis thought to be of infectious origin. As a result, the allergic nature of the symptoms is not recognized until asthma develops.

Hay fever, especially the tree and grass types, is frequently overlooked and erroneously diagnosed as a Spring or a Summer cold.

Likewise, the exacerbation of nasal allergy which simulates the common cold in its symptoms often cannot be definitely diagnosed except on the basis of the cytologic examination of the nasal secretions for eosinophils.

Patients with nasal obstruction, obstruction of the Eustachian tube and deafness due to allergy are often subjected to submucous resection without relief of symptoms.

The atypical type of nasal allergy is often obscured by the prominence of some other condition in the clinical picture, such as a discharge from the ear, a swelling of the parotid gland, a swelling of the palate, frontal headache, cough and other associated conditions or manifestations of allergy.

ANATOMY.

Burnham[17] presents a summary of his excellent histopathological work previously published in the *Journal of Laryngology and Otology*, and then gives protocols of five experiments on patients to prove the clinical value of his work.

It is a widespread belief that hypertrophies of the posterior tip of the inferior turbinate are nearly always due to irritation from nasal discharge flowing over the surface of the posterior tip. Burnham, however, has grounds for believing that hypertrophies of the posterior tip of the inferior turbinate may result from overstrain of cavernous tissue in the front third of the inferior turbinal. The reasons for this interesting conclusion can be found in his article. This is only one of several most interesting and somewhat revolutionary observations of clinical significance.

Van Alyea[18] contributes an anatomic study of the sphenoid sinus with consideration of the clinical significance of its structural characteristics. There are 13 illustrations and adequate reference is made to the standard authorities.

The sphenoid sinus originates during the third fetal month as an invagination of the nasal mucosa in the posterior extremity of the cartilaginous nasal capsule. Its ostium has been studied as to its location in the sphenoethmoid recess and as to its clinical accessibility. The opening was deemed accessible in a vast majority of cases. In 16 per cent, largely because of its size and location, the ostium was inaccessible or could be reached only with difficulty.

Smith[19] endeavors to answer the question how commonly and to what extent are the ganglion cells of the olfactory nerves and, therefore, the olfactory nerve fibres destroyed. He approached the problem by studying the olfactory fibres where they come together on the surface of the olfactory bulb in adult human brains which had been removed at autopsies and turned over to the Department of Anatomy of the University of Toronto as normal specimens.

Serial sections of 163 olfactory bulbs were prepared with a view to studying the incidence of atrophy of the olfactory nerves. The observations reveal that atrophy of these nerves

is common in adults — 55 per cent of these bulbs had lost more than three-fifths of their complement of olfactory nerves and 13 per cent had lost all their nerves. Only 29 bulbs were considered to have a normal complement of olfactory nerve fibres. The number of olfactory nerve fibres reaching a bulb was estimated from the total number of glomeruli. This was possible because the average number of fibres terminating in a glomerulus is believed to be constant and the glomerulus disappears when all the olfactory fibres which terminate in it have degenerated. For this study a normal bulb was one which was estimated to contain 10,000 or more glomeruli. Partial atrophy of olfactory nerves may occur in all parts of a bulb or be localized to the anterior or, less commonly, to the posterior end. The last fibres to survive are those that pass to the middle of the bulb. There was no tendency for atrophy to occur more frequently on one side of the nose than on the other. The two bulbs for a given brain usually showed a similar degree of atrophy, but in certain cases the difference on the two sides was considerable. The atrophy of olfactory nerves is believed to be due to destruction of the olfactory ganglion cells located in the nasal mucosa by the inflammatory processes that occur in the mucosa. Recent studies of the sense of smell do not reveal the impairment which the high incidence of atrophy of the olfactory nerves might lead one to suspect.

FOREIGN BODIES.

Donnelly[20] in an illustrated article describes and comments on a foreign body in the nose of a child, age 7 years. The foreign body, a metal screw, had been in the nose of the child for two years without any perceptible discharge or odor.

The girl was admitted with the hope that her breathing, appetite and general health would be improved by tonsillectomy and adenoidectomy. She had had difficulty in breathing through the right nostril and was frequently troubled with a frontal headache for two years. At times she had complained of tenderness over the right side of her nose when her face was being washed. Diagnosis was made by Roentgenogram.

TONSILS AND ADENOIDS.

In my 1940 survey an article by Albert D. Kaiser[21] on the significance of the tonsils in the development of the child was

overlooked. This article has been admirably summarized by Campbell[22] as follows:

Follow-up studies on tonsillectomized and nontonsillectomized children were undertaken to show the trend of certain complaints in two groups over a 10-year period.

Frequently inflamed tonsils and markedly hypertrophied tonsils impair normal physical development and should be removed after 4 years of age. It may be expected that at least half of these children will be materially improved.

It cannot be demonstrated that the tonsils are often a causative factor in the common cold, otitis media, sinusitis and laryngitis, and tonsillectomy does not offer a solution for their eradication. The tonsils are not often responsible for pulmonary infections such as pneumonia, bronchitis and tuberculosis. They play a less significant rôle in the causation of rheumatism and nephritis than was formerly supposed; however, a reduction in the number of throat infections following tonsillectomy has a beneficial effect on the rheumatic patient.

On the whole, the writer feels the tonsils are not as great a menace as had been frequently suggested.

Crowe[23] states that in the office, the out-patient clinic and the hospital the lymphoid tissue in the pharynx, particularly that in the nasopharynx, plays a most important part in otolaryngology. Primary infections in this tissue extend to the sinuses, ears, larynx, bronchi and lungs. This is true particularly in children. It is the duty of otolaryngologists to foresee and treat conditions in their patients which they know by experience may lead to otitis and mastoiditis, deafness, sinusitis, asthmatic bronchitis and other systemic disturbances.

Crowe reports that he and his associates during the past 12 years have used with great success a radon nasal applicator. The radon is of value in reducing the size of adenoids as an adjunct to the treatment of mouth-breathing, recurrent nasopharyngitis, impairment of hearing due to tubotympanic catarrh, suppuration of the ears, infection of the accessory nasal sinuses and asthmatic bronchitis. The radon treatments do not supplant surgical operation but are much more effec-

tive than sprays, nasal drops and local applications and in many cases have proved preferable to operation in tiding the patient over a difficult period. The radon applicator is particularly valuable in the treatment of young children, in reducing the size of lymphoid tissue in the nasopharynx and thus providing better breathing space and better drainage for the nasal cavities and Eustachian tubes. Radium must not be used in the presence of acute nasopharyngitis. It has no inhibiting effect on the growth of bacteria.

Infections of the upper respiratory tract, especially in children, result in hyperplasia and hypertrophy of lymphoid tissue. An interesting fact about the nasopharynx was brought out by a study of 1,365 school children during the past year. All the children were between the ages of 8 and 14 years. In 755 the tonsils and adenoids had been removed at various hospitals in Baltimore. As a rule, the tonsils had been cleanly removed, and in many the oropharynx looked normal, but more than 75 per cent had a marked recurrence of adenoid tissue in the nasopharynx. This was due not to incomplete operation but to the fact that in this area lymphoid tissue is an integral part of the mucous membrane. It cannot possibly be removed in its entirety unless the entire thickness of mucous membrane is taken out, a procedure which is manifestly impossible.

Therefore, in a large percentage of children whose tonsils and adenoids have been removed before the age of puberty, otolaryngologists must expect, look for and treat the recurrence of the tissue in the nasopharynx and pharynx if they are to obtain the best results. The proper treatment is irradiation, not a second operation. It is just as important for the otolaryngologist to examine the nasopharynx, the tympanic membranes and the hearing of children once or twice a year for the preservation of hearing as it is for the dentist to examine the teeth at intervals for their preservation.

He emphasizes that normal function of the Eustachian tube is essential for good hearing. It is quite true that many children with enlarged adenoids or a recurrence after operation which obscures a view of the pharyngeal orifice of the tube have no impairment of hearing, but these children should be watched, and at the first sign of impaired hearing for high tones the nasopharynx should be irradiated.

Infected adenoids should always be removed surgically. The combination of operation and irradiation, or irradiation alone, prevents recurrences, or reduces the size and susceptibility to infection of the recurrent nodules of lymphoid tissue in the nasopharynx and pharynx. If radiation is employed, the otolaryngologist must realize that it does not destroy or permanently remove adenoid tissue. It merely slows up, or for a time stops, the reproduction of lymphocytes and in this way causes a gradual decrease in size.

Crowe concludes by stressing four points as follows:

1. The recurrence of adenoids after operation on young children is so common that it must be regarded as normal.

2. This recurrent lymphoid tissue may impair the function of the Eustachian tubes and cause a low-grade tubotympanic catarrh, which may lead to chronic progressive deafness.

3. Recurrent or hyperplastic nodules of adenoid tissue in and around the pharyngeal orifice of the Eustachian tube are so located that they cannot be removed surgically.

4. Lymphoid tissue is so sensitive to radiation that the dose employed in the treatment of the nasopharynx is far below the amount that could cause any irritation or injury to the mucous membrane or surrounding structures. Scar tissue, dryness of the nose or throat and atrophic changes in the nasal mucosa do not follow treatment of the nasopharynx with radon, providing the proper dose is given at the proper intervals. This statement is based on observation of hundreds of children. Many of them have been followed for 10 years or more. If used carelessly or if entrusted to a technician, radium therapy may be extremely dangerous. It should never be given in the presence of acute nasopharyngitis. The object of the treatment is to reduce the size of lymphoid tissue. It has little or no direct action on bacteria. Radiation is of no value in the treatment of chronic suppuration of the middle ear, otosclerosis or any form of inner ear or nerve deafness. It is used for the sole purpose of reducing obstructing nodules of lymphoid tissue, decreasing the secretion of mucus and restoring the normal ventilating function of the Eustachian tubes. For this reason radiation is more often beneficial for children than for adults. To obtain the best results it must be used before changes in the middle and inner

ear, secondary to partial tubal obstruction, have irreparably damaged the structures of the middle and inner ear.

In a clearly written, simply worded, adequately illustrated article, Negus[24] draws attention to the prevalence of and the effect of imperfect adenoidectomy. The complete article and the stimulating discussion in which many eminent rhinologists took part are recommended for study.

Negus confesses that for him the efficient removal of adenoids is a more difficult proceeding than the removal of the tonsils and, in his opinion, is the more important of the two.

The results of these operations fall into three categories: those in which there is marked improvement; those with little or no benefit; and a third unfortunate group in which the state of the patient is made worse. One factor in failure is disregard of the essential indications, and the second is inefficiency in performing the operation.

Further stimulation for this article is the interest, renewed in recent years, regarding sinusitis in childhood. It is undisputed that infection of the maxillary, associated in some cases with involvement of the ethmoidal sinuses, is relatively common in children, owing to disordered action of the normal mechanism of defense. The question in doubt is the determination of the cause. He suggests that an important factor is the presence of adenoids, and that if these can be removed efficiently the sinusitis will recover in the majority of cases. A few patients fail to be cured; in some instances this may be due to inefficiency of the nasopharyngeal operation and not to factors inherent in the sinuses or nose.

If nasal sinusitis in children cannot be cured by relatively simple means, the necessity for operations on the sinuses themselves may arise, a contingency to be avoided. Any encouragement to perform such operations apart from simple lavage is liable to abuse.

In his article, Negus attempts to show how ill effects of unsuccessful removal of adenoids come about and makes suggestions as to avoidance of failure.

The reader should note that he points out that the palatothyroideus muscle forms the support of the posterior pillar.

The reader also will be interested to notice that Negus advises that the blade of the adenotome should be sharp.

The second paper in this symposium was given by W. Stirk Adams,[25] who states that sinusitis of catarrhal type with mucopurulent exudate may occur in children at all ages, and says that suppurative sinusitis in children is rare and almost always associated with bronchiectasis.

He asks that the term "adenoids" should not be used to indicate a hypertrophy of Luschka's tonsil of unknown pathology completely obstructing the nasopharyngeal airway but that it should be used to indicate the anatomical structure — namely, the lymphoid tissue in the nasopharynx. He asks his audience to consider whether all adenoid hypertrophies are inflammatory. The proliferation of the follicles with some ulceration of the surface epithelium of the nasopharyngeal lymphoid tissue accompanying an acute upper respiratory infection he considers as a normal function of the lymphoid tissue to local infection which allows the child time to mobilize defenses.

The lymphoid tissue of the nasopharynx, however, may harbor an unresolved acute infection or a subacute or a chronic infection. Of these he suggests we can recognize four main types.

In the first there is an intensification of the normal folds on the surface of the pad as seen by the postnasal mirror. The surface is smooth and may be covered by mucoid exudate. The mass overhangs the posterior choanae and extends laterally into the fossa of Rosenmüller. When examined from time to time, little variation in size is seen, especially during the winter, and although resolution occasionally occurs, it is unlikely.

This type appears to him to be due to a persistent infection, and is frequently the site of acute exacerbations. It acts as a focus of infection and its effect on the associated catarrhal sinusitis is local and deleterious.

The second type is that of the large adenoid pad which produces almost complete obstruction of the postnasal airway. In this, frequent attacks of upper respiratory infection are uncommon and the parents tell me the child has a persistent unvarying cold.

The third type of adenoid pathology is entirely different from the two preceding. The normal folds are missing, the gross hypertrophy never seen, while postnasal examination with finger or mirror reveals a pyramid with its broad base on the posterior wall of the nasopharynx and a smooth external surface rising to a truncated apex towards the soft palate. When opened, no macroscopic crypts can be detected and crushing by the finger reveals a firm fibrosis.

This type he found very seldom. It is associated with a catarrhal sinusitis and in asthenic though not necessarily underdeveloped children up to puberty. Nasal obstruction is never present.

In this type the influence of what must be a very chronic infection on the associated sinusitis is as a toxic focus, producing general effects rather than local, and removal of this focus does not produce immediate resolution of the sinus infection.

The fourth type of adenoid infection is met consistently in chronic bronchiectasis and chronic suppurative sinusitis. So much so that he regards it as diagnostic of one or both of these conditions.

Here the adenoid pad is represented by a flat, velvety, infected area not more than one-fourth inch in thickness, spread evenly over the whole of the posterior surface of the nasopharynx.

In considering the requirements for a satisfactory removal of adenoids, Adams stresses those measures necessary to avoid postoperative complication.

If operation is carried out within a month of the onset of an acute upper respiratory infection, he has found the incidence of postoperative otitis media and of reactionary hemorrhage higher than when operation is deferred. Hence, he makes a rule that no adenoid operation should be carried out within a month of the onset of such an infection.

In the child whose recurrent attacks of nasal infection occur at more frequent intervals than a month, he aims at operating as soon as clinical signs of infection are at a minimum.

The time of year at which the operation should be undertaken is also important as the Summer offers a better chance of a rapid and complete convalescence, but if the child's future is prejudiced by persistence of the infection, undue delay is not justified.

In the discussion which followed, Crooks said that he considered adenoids were the result of nasal or sinus infections. Operation was not the best way of treating an infection of a sinus, but if the adenoids were so large that they caused an obstruction they should be removed. The proper treatment of sinusitis was to treat the sinus in one way or another.

In trying[26] to determine the relation of tonsillectomy and adenoidectomy to poliomyelitis, Fischer, Stillerman and Marks[27] studied the age, date of onset, type of poliomyelitis, presence or absence of tonsils, date of tonsillectomy and date of death of the 507 children from 3 to 12 years of age, who were treated in Toronto during the 1937 epidemic of poliomyelitis. Of the 507 children, 231 had their tonsils and adenoids removed, the tonsils of 267 were still present and for nine there were no data. There was no significant difference in the monthly incidence between the tonsillectomized and the nontonsillectomized patients. There was an increase in cases in both groups during the last week in July when the epidemic began. Up to 6 years of age, children with intact tonsils were in the majority. The bulbar form of poliomyelitis was significantly higher in the tonsillectomized (except in those who had their tonsils removed from two to six months before onset) than in the nontonsillectomized group, being 18.6 and 7.5 per cent, respectively. The nonparalytic form was slightly but not significantly greater in the group with tonsils. The difference in the proportion of the spinal forms was not significant. The major cause of death was respiratory failure resulting from involvement of the bulbar nuclei. The mortality (6.5 per cent) among the tonsillectomized children was higher than among the children with intact tonsils (1.5 per cent). Bulbar poliomyelitis was higher and the nonparalytic form lower among those tonsillectomized within a month of onset than among those operated on more than a month before the onset of poliomyelitis. Twelve cases in which poliomyelitis developed within a month of operation are reported. The poliomyelitis was bulbar in seven of these cases. From infor-

mation on the general incidence of tonsillectomy among school children it was possible to compute the incidence of poliomyelitis during the 1937 epidemic among recently tonsillectomized children. A higher incidence was observed among the recently tonsillectomized group than among other children. The frequent recent reports of the occurrence of poliomyelitis in recently tonsillectomized children supports this observation. The higher incidence of bulbar poliomyelitis among tonsillectomized children suggests the possibility that the tonsillopharyngeal area is one port of entry for the virus and that the tonsils and adenoids serve as a barrier. Therefore, tonsillectomy and adenoidectomy had best be postponed while poliomyelitis is prevalent in a community.

The relation between abscess of the lung and operations on the tonsils has been a matter of knowledge and discussion for some 30 years. The occurrence of lung abscess has been discussed at length. During the past decade the relationship between bronchiectasis and inflammatory lesions of the nose and throat has been studied but perhaps not to the same extent as in the case of lung abscess.

Ormerod[28] attempts to correlate these investigations, to assess the part that inflammatory conditions of the nose, paranasal sinuses and pharynx and operations performed in these regions play in the etiology of pulmonary abscess and of bronchiectasis, and also discusses to what extent active treatment should be applied to the nose and throat as a preliminary or as an adjuvant to surgical measures in the chest itself. His discussion is restricted to those conditions for which surgical measures become necessary. He draws attention to Graham's proof of the inter-relationship betweeen sinus disease and bronchiectasis. The latter watched certain cases of bronchial fistulas where there was only very slight discharge from the external opening of the fistula. During an attack of acute sinusitis the discharge became purulent and much more copious, and the mucosa at the orifice became red and swollen. On the subsidence of the sinusitis the mucosa of the bronchial fistula returned to its previous condition and the discharge was reduced to the original amount,—a very clear proof of the effect of the paranasal inflammation on the bronchial mucosa.

He presents evidence that a large number — up to 80 per cent — of cases of bronchiectasis have some degree of infec-

tion of the paranasal sinuses but that diseases of the tonsils play a very slight part in the causation of this disease. Some 20 per cent or more of lung abscesses had a tonsil operation as a possible causative factor. A few of them had upper respiratory operations but sinusitis in itself does not appear to be responsible for lung abscess.

The connection between the upper and lower respiratory tracts may be by: *1.* Aspiration. *2.* Lymph stream. *3.* Blood stream. *4.* Direct continuity.

1. Aspiration: This path is suggested by the high proportion of upper respiratory disease, by the fact that large numbers of the cases have undergone operations under a general anesthetic and by experimental proof that various colored and radiopaque substances can pass from the upper respiratory tracts to the bronchial lumen.

2. Lymph Stream: The lymphatic connections between the nose and the chest are somewhat complex and this pathway is difficult of proof, but the high proportion of upper respiratory disease may be held to support this theory, and it has been shown that dye-stuffs can pass from the paranasal sinuses to the lymphatics of the chest. It may be possible, therefore, that in a certain number of cases organisms may follow this path.

3. Blood Stream: The nose and throat are very vascular and after operations many veins are left widely open, hemostasis depending on clotting in these veins. It is not a very far cry from this condition to a septic thrombosis and emboli, followed by septic deposits in the lungs. In many cases lung abscess follows abdominal operation and especially where the abdominal condition is a septic one, and the mobile infected field which has been operated upon favors the formation of septic emboli. This embolic theory is favored by the large number of upper lobe abscesses (Maxwell, Clerf and Todd). The proportion of lower lobe abscesses to the whole, after abdominal operations, is greater than after upper respiratory operations (Maxwell) and these facts require an explanation other than that supplied by the aspiration theory. The embolic theory would seem to explain these phenomena.

4. Direct Continuity: Wesson's description of bronchosinusitis disease may explain the etiology of certain con-

ditions. It is possible that bronchiectasis and some lung abscesses, and upper respiratory disease are all sequelae of the same generalized inflammatory process.

On the whole, the aspiration theory of the cause of lung abscess seems to be the most obvious, the blood stream or embolic route being responsible possibly for a number of cases, but it is not certain in what proportion this route comes into play. The lymphatic route, though theoretically possible, is hardly likely to account for more than a very occasional case. The bronchosinusitis disease and its sequelae may explain many cases of bronchiectasis, though probably not abscesses in the lung.

He also discusses the question of the effects of upper respiratory disease on the surgical treatment and summarizes this as a decision as to whether operative measures should be adopted for the cure of the upper respiratory lesion and, if adopted, at what stage in the treatment. The ideal procedure would be the removal of the primary focus in the upper air passages before dealing with the secondary condition in the lung. The sinuses should be drained, polypi removed and severe septal deflections corrected before operation on the chest. He points out the difficulty in clearing away such foci in children with severe bronchiectasis, but advises, however, that the nose and throat should be cleared of infected tissue before the child leaves hospital, as there is the possibility that it may be postponed indefinitely once the child has returned home, and reinfection of the chest from the upper airways might undo the good results obtained from surgical operation on the chest.

Price Thomas[29] discusses the relationship between rhinology and thoracic surgery from the standpoint of the thoracic surgeon. He stresses the common pathologies which these two specialties are called upon to treat.

The common statement of the layman, "The cold always goes down to my chest," must date from time immemorial and yet it is only of late years that the profession has awakened to its true significance. It is astonishing how often we disregard out-patients' statements when often they are the keys to the truth. This commonplace remark is as accurate a statement in its main essentials as a whole treatise on the

relationship between sinus infection and infections of the lower respiratory tract. Thoracic surgeons in the main now invariably submit our bronchiectatics to our nose and throat colleagues before embarking on surgical removal of the diseased lobe or lung, because experience has shown that operation performed in the presence of sinus infection always leads to disappointing results. It was in fact these results which drew our attention to the close relationship between the two conditions. It is also noticeable that if a sinus infection is cleared up in a bronchiectatic patient, amelioration of symptoms occurs in many of the cases. He doesn't know whether the converse of these observations has been appreciated widely enough, that patients with sinus disease should be suspected of having a corresponding affection of their bronchial tree. Aspiration from the nose into the bronchial tree can easily be demonstrated by instilling lipiodol into the nostril of a sleeping child, the lipiodol can be demonstrated first thing next morning by X-ray in the lower lobe bronchi, most often on the left side.

He does not wish it to be understood that he thinks bronchiectasis is caused by sinus infection, but that the dilated bronchi, dilated from other causes, often become infected in this way from the upper air passages.

ATROPHIC RHINITIS AND OZENA.

Strachan[30] reports a careful attempt to produce the results obtained by Mortimer, Wright and Collip on patients suffering from ozena treated with estrin sprayed into the nose.

It is his impression that in this series of cases treated with estrin no local improvement resulted from the hormone itself. Any local improvement was to be attributed to the habit of cleansing the nose, acquired during the time under intensive treatment.

The cases were all children and were all typical examples of atrophic rhinitis. They were carefully examined and treated for three to four months. They were very amenable to treatment and regular in attendance at the Clinic. With one exception they all returned for re-examination two years later.

In the course of a short illustrated article on atrophic rhinitis with ozena, Fox, *et al.*,[31] report an infant, age 5 months,

with definite primary atrophy of the right nasal tissues and decided crusting and ozena.

Estrone has been enthusiastically advocated for the treatment of ozena. However, the Council on Pharmacy and the *American Medical Association Journal* issued a warning against the indiscriminate and prolonged use of it and allied substances. This warning was repeated in the 1940 resumé of rhinology in children. The danger lies in the possible development of mammary carcinoma in patients who are susceptible to such growths. Since then the *American Medical Association Journal*[32] has printed an abstract on the subject which deals with part of the problem.

In an effort to determine whether estrogen therapy induced endometrial or vaginal epithelial proliferation which may lead to the formation of neoplasm, Geist and Salmon[33] made biopsies of the vaginal and endometrial mucosas of 206 women during various stages of treatment with estrogen. The treatment lasted for from six months to five and one-half years. Determination of the effect was made in part by biopsy. The endometrium at the end of long periods did not show any greater proliferative activity than after the initial estrogen therapy. In human beings it is impossible to administer the huge doses of estrogen that would justify comparison with the experimental production of carcinoma in rodents; however, within the limits of dosage used in this investigation (up to 52,400,000 international units) there is no justification for the fear that *genital** carcinoma may result from the therapeutic use of estrogen.

CASE REPORTS AND TUMORS.

Beinfield[34] reports maxillary sinusitis and staphylococcus aureus bacteremia in a boy, age 8 years. Cultures of material taken from the nose and of blood and pus all showed staphylococcus aureus. A pustule developed on the skin. Sulfanilamide reduced the number of colonies of staphylococcus aureus in the blood from 25 to two per cc. in three days.

Acute osteomyelitis of the superior maxilla confines itself primarily to nurslings and infants. Harlow[35] reports a case of this disease occurring in a child, age 6 years, with recovery

*Italics by abstract editor.

following conservative treatment. He states that opinions are divided on the pathogenesis of this disease. He states that injury to the deciduous or permanent teeth when operating on the maxilla in infants and children is a possible danger always to be kept in mind. The course of this disease is often lengthy. The case reported has a course over eight months. Avitaminosis as a possible contributing factor in the pathogenesis of osteomyelitis of the maxilla is mentioned.

Wilkerson[36] reviews mucocele of the frontal sinus and cites two cases from the literature in boys of 13 and 14 years, respectively.

Schall and Cordray[37] report a rhabdomyosarcoma of the posterior septum in a boy, age 6 years.

This patient developed nasal obstruction following measles, although he had his tonsils and adenoids removed one year previously. Examination showed a new growth filling the postnasal space and apparently originating from the posterior border of the septum. Removal of the tumor and microscopic sections revealed it to be a rhabdomyosarcoma. The maximum dosage of external radiation was used, but the tumor recurred and had again to be removed. At this time the patient came under Schall's care.

Both posterior choanae were filled with tumor, which arose from the posterior border and margins of the nasal septum. The tumor was approached by the removal of the entire nasal septum, the surgery being supplemented by the local application of 600 mg. hours of radium radiation. During the next 10 months this patient underwent two lateral rhinotomies for recurrences, as well as receiving the maximum dosage of radiation, both locally and externally. The terminal stage was characterized by cervical, pharyngeal and mediastinal metastasis.

Tumors consisting of striated muscle are not only very rare but, according to Boyd, they do not occur in voluntary muscle. They are usually found in the kidney, testicle, vagina. A pure rhabdomyosarcoma is the rarest of all, being practically confined to the heart. They are common in children, and probably arise in embryonic rudiments.

In this neoplasm, the muscle is mingled with other tissues, and only some of the cells are cross-striated. These mixed

tumors are highly malignant, and metastasize by the blood stream. This tumor is not radiosensitive and the treatment should be surgical.

Arons[38] reports an ossifying fibroma in a white boy, age 11 years. Three photographs accompany the article. The case was originally diagnosed by the pathologist as osteogenic sarcoma and, because of this, heavy irradiation was administered. The true diagnosis was made at a later date. Although the course of treatments was more intensive than would be required for ossifying fibroma, the result indicates that the latter neoplasm may be successfully treated by irradiation alone, instead of the usually recognized procedure of radical surgical extirpation.

Figi[39] reports a case of outstanding interest. A boy, age 11 years, had a highly malignant carcinoma of the nasopharynx with bilateral cervical metastasis, who remained well 10 years afterwards.

The original complaint was earache and a lump high in either side of the neck. The cervical masses had progressively increased in size since they first had been noticed about six months previously. There was a hard, irregular, fixed mass about 4 cm. in diameter in both upper cervical regions, just below the auricle. Also, there were numerous smaller nodules of the same consistency extending to the base of the neck and into the supraclavicular region on both sides. A vascular, ulcerated mass filled the upper portion of the nasopharynx and obstructed both choanae. Clinically, this appeared to be a highly malignant neoplasm, although the patient did not complain of the deep-seated, boring pain so characteristic of such lesions in this situation, nor was there evidence of involvement of any of the cranial nerves. General physical examination otherwise gave essentially negative results.

Leucocytes numbered 14,600, 78 per cent of which were neutrophils, but other laboratory studies, including urinalysis, von Pirquet and Mantoux tests, and Roentgenograms of the thorax gave negative results.

Tissue removed from the nasopharyngeal mass for microscopic examination proved to be squamous-cell epithelioma, Grade IV. Biopsy of the cervical nodes was not made, but

clinically these appeared definitely to have undergone malignant change, and a diagnosis of epithelioma of the nasopharynx, with bilateral cervical metastasis was made. Irradiation with radium was advised, although a probable poor prognosis was given.

Surface packs of radium were applied over both sides of the face and neck, using 2 mm. of lead and 1.5 mm. of monel metal screening and a block of wood 2.5 cm. in thickness to secure distance. A total of 15.022 mg. hours of irradiation was administered. Radium tubes on a pliable applicator also were placed directly in contact with the tumor in the nasopharynx. Subsequently, at intervals of from six weeks to nine months, treatment with surface radium packs was repeated on four occasions in doses ranging from approximately a half to two-thirds of the original application, but further treatment of the nasopharynx was not given.

On returning for observation six weeks following the primary irradiation, the patient had gained 11 pounds (5 kg.) and the father stated that the boy never had appeared to be in better general health. The nasopharynx was entirely free from neoplasm but multiple small nodes were still present in both sides of the neck. These nodes disappeared completely following further radium therapy.

On Aug. 31, 1938, a little more than 10 years following the primary visit, the patient returned to the Clinic for consideration of an area of actinodermatitis that had developed on either side of the neck (see Fig. 1). He was in excellent general health, the nasopharynx was negative except for scarring, and only very small, apparently fibrous, cervical nodes were palpable. In the area of actinodermatitis of the neck, which obviously had resulted from the intensive irradiation, there was rather marked thickening but there was no evidence of malignant change. and replacement with full-thickness skin grafts was advised. This procedure was carried out under intratracheal anesthesia on Sept. 3, 1938. Microscopically the tissue removed from neck revealed the changes of actinodermatitis, with marked subepithelial fibrosis only. The skin grafts healed perfectly, and the patient was dismissed approximately three weeks later. Although he has not been heard from since, it seems safe to assume that he has had no further trouble.

Parkinson[46] states that dermoid cysts on or near the dorsum of the nose are unusual and of special interest. He reports this condition in a girl, age 4 years. She had a swelling of the nasal dorsum about the size and shape of a small almond, which was known to have been present at least two years. The mass was soft and movable. It showed no evidence of inflammation and was not tender. Examination of the child revealed nothing otherwise remarkable.

Although the nature of the mass was uncertain, it was considered advisable to remove it, if for no other reason than to correct the deformity. On Jan. 24, removal was accomplished through a linear incision along the dorsum of the nose. Considerable fibrous tissue was encountered, requiring sharp dissection throughout. A depression was noted, centered about one-third way down along the dorsum, and the nasal bones appeared to be shortened. On completion of dissection it was found that small openings had been made into the most anterior portions of both nasal fossas. No attempt was made to suture these separately. The wound was closed without drainage. Convalescence was uneventful. Massage of the nasal bridge for a moment each day was carried out for several weeks following healing, to prevent adherence of the scar.

Examination of the dissected mass by Dr. Paul Michael, pathologist, revealed a tangle of dark hair in a quantity of greasy, putty-like material. The wall was thickened by fibrosis. The sac was lined by flat, squamous epithelium, with many hair follicles and sudoriferous and sebaceous glands in the surrounding wall.

The child was last seen Jan. 4, 1941, three years after the operation. The line of incision on the nasal dorsum was scarcely visible and was entirely nonadherent. The nasal bridge was slightly broad but showed no depression or other deformity.

Nasal tumors composed wholly or in part of brain tissue are rare. The records of 11 only could be found in 1928.

Such a growth may appear in any part of the nose and is in all cases congenital. It shows little or no tendency to grow and there is no record of metastases in any instance. In some cases the growth has recurred after removal. According to site, there are three types, extranasal, intranasal, and mixed intranasal and extranasal.

Schwartz and Isaacs[41] report such a tumor in a boy, age 13 months. At birth a mass was noticed in the vestibule of the right naris. According to the mother, this had been slowly growing larger and now completely blocked the right nasal orifice. The child kept his mouth open, especially at night, and his sleep was restless. There had been occasional bleeding from the growth, described as a slight ooze.

Examination showed a mass the size of a small bean, elongated and rather firm, arising from the right lateral nasal wall at the mucocutaneous junction and extending upward and backward along the lateral nasal wall toward the right inferior turbinate. It completely occluded the right naris. The posterior limit of the tumor could not be determined at this examination.

On March 1, the growth was removed. The patient was last examined on Jan. 15, 1941, 10½ months after operation. There had been no recurrence of the tumor. Four photographs of microscopic sections accompany the article.

The authors admit that it is possible that this tumor arose from the neural elements belonging to the subcutaneous tissue or from neural embryonal rests.

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IN MEMORIAM

ROBERT EMMETT BUCKLEY, M.D.

Dr. Robert E. Buckley. prominent otolaryngologist, died July 25, 1942, at Roosevelt Hospital, New York, at the age of 53 years.

Born in New Britain, Conn., he received his M.D. degree from Yale University and served his interneship at St. Mary's Hospital, Brooklyn.

In 1917, Dr. Buckley joined Roosevelt Hospital Unit and was physician in charge of the Nose and Throat Department at Base Hospital 15, Chaumont, France.

After the World War he resumed his service at Manhattan Hospital and in 1926 became Professor of Otolaryngology at Post-Graduate Medical School and Hospital until he was recalled to Manhattan Hospital after the death of Dr. John E. MacKenty. During his association with the latter hospital he simplified MacKenty's method of laryngectomy and improved the artificial larynx.

He was Consulting Laryngologist at Misericordia Hospital, Consulting Otolaryngologist at Roosevelt Hospital and also Consultant for St. Luke's Hospital, Newburgh, N. Y., and Yonkers Professional Hospital.

He was a member of the American Laryngological, Rhinological and Otological Society and the New York Academy of Medicine, Section on Otolaryngology.

His widow, the former Madge Muir, two daughters, Phyllis and Barbara, and two sisters survive. T. E. W.

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